bart
impact
program

IMPLICATIONS OF BART'S MOBILITY AND ACCESSIBILITY IMPACTS FOR THE TRANSPORTATION DISADVANTAGED

technical memorandum

The BART Impact Program is a comprehensive, policy-oriented study and evaluation of the impacts of the San Francisco Bay Area's new rapid transit system (BART).

The program is being conducted by the Metropolitan Transportation Commission, a nine-county regional agency established by state law in 1970.

The program is financed by the U. S. Department of Transportation, the U. S. Department of Housing and Urban Development, and the California Department of Transportation. Management of the Federally funded portion of the program is vested in the U. S. Department of Transportation.

The BART Impact Program covers the entire range of potential rapid transit impacts, including impacts on traffic flow, travel behavior, land use and urban development, the environment, the regional economy, social institutions and life styles, and public policy. The incidence of these impacts on population groups, local areas, and economic sectors will be measured and analyzed. Finally, the findings will be interpreted with regard to their implications for the planning of transportation and urban development in the Bay Area and other metropolitan areas.

DOCUMENT NO. DOT-BIP-TM 35-10-78 CONTRACT NO. DOT-OS 30176

BART IMPACT PROGRAM

IMPLICATIONS FOR THE TRANSPORTATION DISADVANTAGED PROJECT

IMPLICATIONS OF BART'S MOBILITY AND ACCESSIBILITY IMPACTS FOR THE TRANSPORTATION DISADVANTAGED

April, 1978

TECHNICAL MEMORANDUM

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And

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
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16. Abstract

This report examines the mobility and accessibility impacts that the 71 mile Bay Area Rapid Transit System has had to date on the transportation disadvantaged. Three special population groups are the focus of analysis --- ethnic minorities, the elderly and handicapped. These groups are of special concern for transportation planning and policy because of either low-income status or mobility related impairments.

Findings are reported from the investigation of five issues related to BART's impacts for the transportation disadvantaged on increased accessibility to employment, social, medical, cultural and recreational opportunities. Rapid rail patronage levels by ethnic minorities, the elderly and handicapped travelers are examined. The impact on the handicapped of BART's barrier-free design is investigated. Evaluation of these findings is made in the context of the level, nature, and degree of equity in the incidence of BART's mobility impacts. Based on the findings of the study, implications for the transportation disadvantaged of a regional rapid rail transit investment are presented in terms of policy considerations for other areas in which similar systems may be considered.

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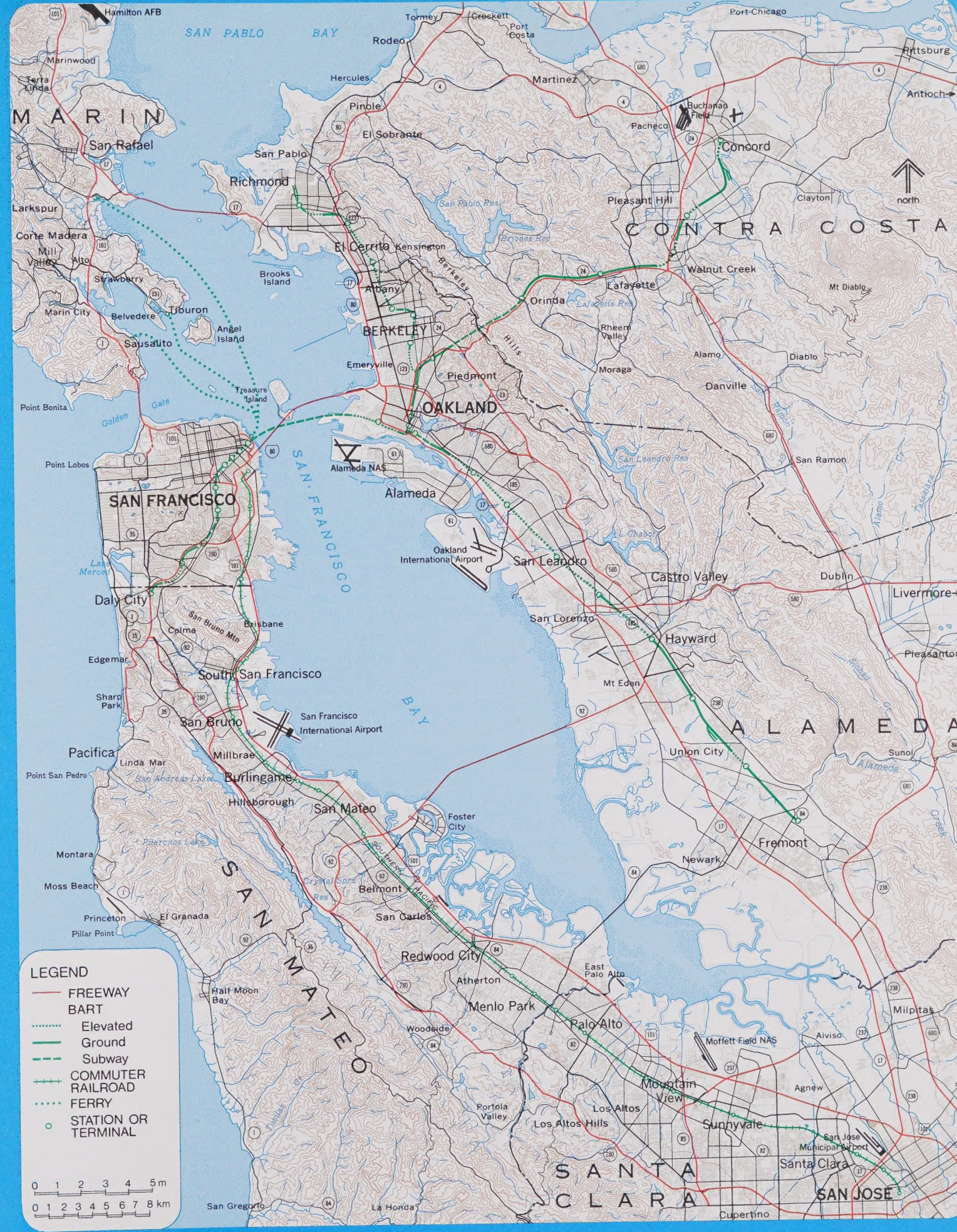

SAN FRANCISCO BAY REGION

CENTRAL AREA

Metropolitan Transportation Commission

BART: The Bay Area Rapid Transit System

Length: The 71-mile system includes 20 miles of subway, 24 miles on elevated structures and 27 miles at ground level. The subway sections are in San Francisco, Berkeley, downtown Oakland, the Berkeley Hills Tunnel and the Transbay Tube.

Stations: The 34 stations include 13 elevated, 14 subway and 7 at ground level. They are spaced at an average distance of 2.1 miles: stations in the downtowns are less than one-half mile apart while those in suburban areas are two to four miles apart. Parking lots at 23 stations have a total of 20,200 spaces. There is a fee (25 cents) at only one of the parking lots. BART and local agencies provide bus service to all stations.

Trains: Trains are from 3 to 10 cars long. Each car is 70 feet long and has 72 seats. Top speed in normal operations is 70 mph with an average speed of 36 mph including station stops. All trains stop at all stations on the route.

Automation: Trains are automatically controlled by the central computer at BART headquarters. A train operator on board each train can override automatic controls in an emergency.

Magnetically encoded tickets with values up to $20 are issued by vending machines. Automated fare gates at each station compute the appropriate fare and deduct it from the ticket value. At least one agent is present at each station to assist patrons.

Fares: Fares range from 25 cents to $1.45, depending upon trip length. Discount fares are available to the physically handicapped, children 12 and under, and persons 65 and over.

Service: BART serves the counties of Alameda, Contra Costa and San Francisco, which have a combined population of 2.4 million. The system was opened in five stages, from September, 1972, to September, 1974. The last section to open was the Transbay Tube linking Oakland and the East Bay with San Francisco and the West Bay.

Routes are identified by the terminal stations: Daly City in the West Bay, Richmond, Concord and Fremont in the East Bay. Trains operate from 6:00 a.m. to midnight on weekdays, every 12 minutes during the daytime on three routes: Concord-Daly City, Fremont-Daly City, Richmond-Fremont. This results in 6-minute train frequencies in San Francisco, downtown Oakland and the Fremont line where routes converge. In the evening, trains are dispatched every 20 minutes on only the Richmond-Fremont and Concord-Daly City routes. Service is provided on Saturdays from 9 a.m. to midnight at 15-minute intervals. Future service will include a Richmond-Daly City route and Sunday service. Trains will operate every six minutes on all routes during the peak periods of travel.

Patronage: Approximately 142,000 one-way trips are made each day. Approximately 200,000 daily one-way trips are anticipated under full service conditions.

Cost: BART construction and equipment cost $1.6 billion, financed primarily from local funds: $942 million from bonds being repaid by the property and sales taxes in three counties, $176 million from toll revenues of transbay bridges, $315 million from federal grants and $186 million from interest earnings and other sources.

March 1978

SUMMARY AND CONCLUSIONS

Purpose of the Implications for the Transportation Disadvantaged Project (ITD)

The Implications for the Transportation Disadvantaged Project is a special study within the BART Impact Program included in order to develop the implications of BART's impacts for the transportation disadvantaged. The entire range of the impacts on the transportation disadvantaged related to the construction and operations of the San Francisco Bay Area Rapid Transit System are considered:*

- Environmental
- Mobility and Accessibility
- Economic, Employment and Financial
- Land Use and Urban Development.

This is the second of four interim reports to be prepared in the ITD Project prior to the preparation of the Final Report. This report focuses on the mobility and accessibility impacts on the transportation disadvantaged associated with BART's introduction into the regional transportation system of the San Francisco Bay Area.

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* Urban Dynamics Associates. Implications of BART's Environmental Impacts for the Transportation Disadvantaged. BART Impact Program. Document No. DOT-BIP-TM 34-10-78. Metropolitan Transportation Commission, Berkeley. January, 1978.
Urban Dynamics Associates. Implications of BART's Mobility and Accessibility Impacts for the Transportation Disadvantaged. BART Impact Program. (Draft Technical Memorandum). Metropolitan Transportation Commission, Berkeley. December, 1977.
Urban Dynamics Associates. Implications of BART's Economic, Employment and Financial Impacts for the Transportation Disadvantaged. BART Impact Program. (Draft Technical Memorandum). Metropolitan Transportation Commission, Berkeley. December, 1977.
Urban Dynamics Associates. Implications of BART's Land Use and Urban Development Impacts for the Transportation Disadvantaged. BART Impact Program. (Draft Technical Memorandum). Metropolitan Transportation Commission, Berkeley. January, 1978.

Definition of Transportation Disadvantaged

The special population groups included in the ITD Project and in this report are:

- the elderly,
- the handicapped, and
- ethnic minorities (Blacks, Spanish-heritage, Asians and other minorities).

These groups are a special concern for transportation policy due to specific physical disabilities which limit mobility or due to general disadvantages vis a vis society, such as low income status.

Population Characteristics of the Transportation Disadvantaged

In the Greater BART Service Area (San Francisco, Alameda, Contra Costa and the northern portion of San Mateo County), ethnic minority persons constitute nearly one-third of the total population (31.9%); 12.7 percent Spanish-heritage, 11.8 percent Black, and 7.4 percent other. Within the Primary BART Service Area (132 zones from which 80% of all BART trips originate), ethnic minorities are found in greater concentrations; 13.6 percent Spanish-heritage, 14.3 percent Black, and 7.4 percent other. Over fifty percent (50.7%) of the Black population in the three county area live in census tracts within one-quarter mile of BART, forty percent (39.6%) of the Spanish-heritage population and only twenty-seven (27.2%) of the non-Black, non-Spanish population.

Based on a classification criterion of more than forty percent (40%), eighteen (18) of the thirty-four (34) BART stations are located in areas (one-half mile radius) of high total ethnic minority concentration. Within close walking distance of BART stations (one-quarter mile) there are 41,293 persons living around stations located in non-downtown and 2,138 in downtown areas of high concentrations of ethnic minorities; 13,200 in non-downtown and 13,815 in downtown areas of low concentrations of ethnic minorities.

The elderly (65 years and older) constitute 9.7 percent of the total population residing within the Greater BART Service Area and 10.2 percent in the Primary BART Service Area. Handicapped persons appear to be generally evenly distributed in the BART service areas, with no identifiable concentrations revealed by census tract data. The elderly are also fairly evenly distributed throughout the BART service area; however, the greatest concentrations of older persons are found around

downtown stations. Four of the eight station areas with high concentrations of elderly (greater than 15%) are located in downtown areas.

Issue Investigations: Conclusions

Five issues relating to the mobility and accessibility impacts of the BART system for the transportation disadvantaged are examined in this report. Information developed in the various project areas of the BART Impact Program has been applied in the evaluation of each issue.

ISSUE NUMBER ONE: "Has BART improved accessibility to employment opportunities for the transportation disadvantaged?"

Conclusion: BART's overall impact on accessibility to employment centers in the Bay Area has been relatively modest for the region as whole. The most substantial improvements in transit travel time savings have been for commuters from outlying suburban residential areas to the downtown areas of San Francisco, Oakland and Berkeley. Correspondingly, the greatest work accessibility benefits have accrued to Whites, and upper income households who are both more likely to live in the outlying residential areas served by BART and more likely to be employed in the CBD areas with highest access to BART.

Based on analysis of transbay travel, there is some indication that BART offers increased accessibility to East Bay job opportunities for ethnic minorities and low income persons living in San Francisco. However, industrial employment centers do not have a high degree of access to BART, either in terms of proximity or adequate bus-egress service. Consequently, BART has not yet provided a significant improvement in the accessibility to blue-collar employment for ethnic minority individuals or low-income households. Although BART has slightly improved job accessibility for the transportation disadvantaged, it constitutes a relatively minor factor in the overall nexus of social, political and economic factors which shape employment opportunities for this population subgroup.

Despite the fact that lower work accessibility gains have been achieved for ethnic minority employees with the introduction of BART, for those residents of the area for whom BART is a possible work travel alternative the rate of BART use as the principle mode of travel to and from work is somewhat higher among

ethnic minorities than it is for the White majority. This reflects greater overall dependency on public transportation services and suggests a shift in travel mode choice, not a major increase in work-related mobility for ethnic minorities.

ISSUE NUMBER TWO: "Has BART provided ethnic minorities, the handicapped and the elderly with improved access to the area's social, medical, cultural and recreational facilities and events?"

Conclusion: Analysis of BART's impact on off-peak transit travel times indicates that BART has contributed slightly to greater accessibility for non-work related activities in Bay Area for the general population, and to a lesser extent, for ethnic minorities. Actual use of BART for these purposes remains at a relatively low level compared to bus and streetcar, as well as the automobile. While relatively small, BART has had its principle non-work related activity impact on travel to and from educational institutions. There is no evidence that this has benefited ethnic minorities to a greater or lesser extent than the total student population. Access to medical care facilities has not been measurably affected by BART for either the majority population or the transportation disadvantaged. Increased benefits of BART for social, cultural and recreational activities could be expected, particularly for the transportation disadvantaged, with implementation of full service levels, weekend service, and group-discount fare policy.

ISSUE NUMBER THREE: "What is the level and significance of BART use by ethnic minorities? Specifically, a) Are minority BART riders representative of the size and socio-economic composition of the service area minority population? b) Do minorities use the system less than one would expect? c) Are ridership rates from stations located in minority areas less than those located in non-minority areas? and d) What attributes of BART best explain the level of BART usage by minorities?"

Conclusion: The BART system provides the greatest accessibility benefits for long-distance, peak hour travel from outlying suburban areas to the downtown employment centers of the Bay Area. Because of the commuter-orientation of the system and the fact that the ethnic minorities of the Bay Area live in the greatest concentrations in the central urban areas of the region, substantial ridership by

ethnic minorities may not have been expected. With respect to the Greater BART Service Area population, the rate of BART ridership is higher than the general population rate for Asians, generally equivalent for Whites and Blacks, and significantly less for Spanish-heritage. With the exception of the Spanish-heritage population, the lower average accessibility gains provided by BART have apparently been off-set by the fact that the minority population is significantly more transit dependent than the majority population of the area and that more than half the stations are located in areas of high concentrations of minorities.

The potential travel service benefit for ethnic minorities of a new rapid rail element in the total transportation system of the area has been constrained by a number of factors. The most important of these is that for shorter distance trips, BART does not compete well with the generally adequate and higher levels of conventional transit services existing in most central areas where ethnic minorities live in the greatest concentrations. Other factors, such as higher perceived user costs, lack of schedule reliability and cultural factors, including language barriers, contribute to a lesser extent in minimizing BART's potential use among these population subgroups.

ISSUE NUMBER FOUR: "Has BART operation adversely affected minorities by causing reductions in AC transit and MUNI service in ethnic minority areas?"

Conclusion: Had recommended local transit service line adjustments been fully implemented within the BART travel corridor, ethnic minorities would have been disproportionately affected, given patterns of residential location, greater transit dependency and lower BART usage. Public protest blocked implementation of most service eliminations or reductions in AC Transit and MUNI operations. Thus, despite somewhat lower ridership on local bus and streetcar systems in the corridor as a result of BART's operations, the overall level of local transit service has not been downgraded to any appreciable extent. When compared to the designated "No-BART Alternative", the net effect of BART's introduction is shown to be an increase in total transit accessibility for ethnic minorities living in the corridor. However, there is some indication that with growing operational deficits, BART has caused a reduction in State and regional funding to local transit operators over what would probably have been available under

the No-BART Alternative. Given a level of funds committed to transit services comparable to the With-BART system, the question remains whether adequate suburban commuter services, along with upgraded urban area bus services, could have been achieved had BART not been constructed.

ISSUE NUMBER FIVE: "Has BART's potential benefit for the handicapped been realized with the provision of a largely barrier-free rapid rail facility?"

Conclusion: Despite the extensive provision of facilities and consideration of the handicapped in the design of BART, its full potential to substantially increase the mobility of disabled persons has not been realized. Use of BART by the disabled is relatively low; however, there is some indication that it is increasing at a rate faster than the growth of total ridership. With increased service levels, improved equipment reliability, and implementation of needed design modifications identified by BART planners, greater utilization can be expected. Also, projected accessibility improvements in local bus feeder and para-transit systems will remove existing obstacles in getting to and from BART stations. Curb cut and ramp construction programs underway in Berkeley, Oakland and San Francisco are removing many level access barriers to movement beyond station areas. With these improvements, it is clear that BART will have substantially achieved the goal of providing the opportunity of increased mobility for handicapped persons within the Bay Area by the elimination of barriers which previously have precluded travel for many handicapped persons. However, a continuing effort will be required to assure maximum benefit to the handicapped population who face many problems and require consideration of their total travel needs from origin to destination.

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I. INTRODUCTION

BART Impact Program

Built at a cost of $1.6 billion, BART is a major element in the Bay Area program of transportation development. As the first regional rapid transit system to be built in this nation in more than 50 years, BART is of great interest to the Bay Area, other metropolitan areas across the country that are considering investments in improved transportation, and to the federal government which is providing financial aid for transportation improvements, urban development and environmental protection. Considering the magnitude of these concerns, there is a great need for accurate information on the impacts on the Bay Area resulting from the BART investment. Analyses and interpretations of BART impacts can be of vital assistance to those responsible for future transportation policy decisions throughout the nation.

The United States Department of Transportation (DOT) and the Department of Housing and Urban Development (HUD) have sponsored and are funding a long-term, policy-oriented study and evaluation of the impact of the new 71-mile Bay Area Rapid Transit system (BART) in the San Francisco-Oakland metropolitan area. The program is being managed by the area's Metropolitan Transportation Commission (MTC). The program, initiated in 1972, is expected to be completed in 1978. Projects are being prepared by consulting firms, universities, research institutions, and public agencies working under contract with MTC and, in some cases, by MTC itself.

The BART Impact Program has been designed to cover the entire range of possible impacts associated with the construction and operation of the BART system. Six major project areas have served to organize evaluation of BART's impacts:

- Transportation System and Travel Behavior.
- Land Use and Urban Development.
- Economics and Finance.
- Environment.
- Public Policy.
- Institutions and Lifestyles.

Additionally, three special projects have been established to integrate the findings of the major project studies in order to focus on the important implications of the BART experience:

- Implications for the Transportation Disadvantaged.
- Federal Policy Implications.
- Local Policy Implications.

Implications for the Transportation Disadvantaged Project (ITD)

PURPOSE OF ITD PROJECT

The overall purpose of the Implications for the Transportation Disadvantaged Project has been to provide group-specific evaluation of the range of BART impacts studied in the BART Impact Program. The ITD study has been organized to address certain key questions about the effects of BART's construction and operations:*

- What impacts have occurred?
- Where are they occurring?
- Who is affected?
- Are the disadvantaged disproportionately affected?

SPECIAL POPULATION GROUPS STUDIED

In Phase I of the ITD Project, consideration was given to the question of which population groups constitute the transportation disadvantaged.** The conclusion of this study was that only a tenuous case can be made that all members of any general population subgroup can be considered transportation

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* Urban Dynamics Associates. Project Implementation Plan: Implications for the Transportation Disadvantaged Project. BART Impact Program. Document No. DOT-BIP-PD 30-10-77. November, 1977.

** McGuire, Chester. Who Are the Transportation Disadvantaged? BART Impact Program. Document No. WP 27-10-77. Prepared for the Metropolitan Transportation Commission, Berkeley, California. April, 1976.

disadvantaged solely by virtue of their membership in that group. However, since as a group — the poor, the elderly, ethnic minorities, women and youth evidence certain general disadvantages vis a vis society, or specific mobility-related disadvantages, these groups represent a special concern in transportation planning.

In order to provide a reasonable scope for the study, it was determined in Phase I that the focus of the ITD Project should be restricted to ethnic minorities, the elderly and handicapped.* The impacts of a new rapid rail transportation facility are of interest for these groups for similar, but somewhat distinct reasons. All three groups are typically characterized by lower income levels than the general population. Additionally, the reason to study BART's impacts on elderly and handicapped is their impaired mobility due to physical or other disabilities. Ethnic minorities are of special interest for the evaluation of a major public investment in terms of equity considerations, and because differences in culture, lifestyles, and economic status may influence the ways in which they are affected by impacts, perceive or respond to BART's facilities, operation, policies, financing and other effects.** Additionally, since BART was primarily designed to serve long distance travel from outlying sections of the Bay Area, an overall concern is the extent to which it also serves the special transportation needs of the disadvantaged population which is more likely to reside in the central cities of the region.

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* McGuire, Chester. Implications for the Transportation Disadvantaged: Research Plan. BART Impact Program. Document No. DOT-BIP-PD 28-10-77. Metropolitan Transportation Commission, Berkeley. April, 1976.

** McGuire, Chester. The Special Study of Ethnic Minorities in the BART Impact Program. Document Number DOT-BIP-WP 28-10-77. April, 1976.

Ethnic Minorities

The ethnic groups studied in the ITD Project are those which make up the three principal minority populations of the San Francisco Bay Area:

- Blacks,
- Spanish-heritage, and
- Asians (Chinese, Japanese and Filipinos).

Other minority groups are represented to a significantly lesser extent in the Bay Area population and include other orientals (e.g. Korean, Vietnamese) and Native Americans. Where data are available, persons in these groups are included in the analysis of BART impacts on the total minority population of the Bay Area. It has been an objective of the ITD Project to apply consistent definitions of specific ethnic minority groups in all analyses of BART's impacts. However, due to variations in the classification of data found in the many information sources used in the study, this has not always been possible and is noted in the discussion of specific impact analyses.

Elderly

The elderly population is defined to be those persons 65 years of age or older. This transportation disadvantaged group is of particular interest due to generally low-fixed annual incomes and high incidence of mobility impairing disabilities. It is estimated that over sixty-five percent of the non-institutionalized handicapped population in the United States are 65 years of age or older. *

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* McGuire, Chester. Who Are the Transportation Disadvantaged? BART Impact Program. Document No. WP 27-10-77. Prepared for the Metropolitan Transportation Commission, Berkeley, California. April, 1976. Source: U.S. Department of Health, Education and Welfare, National Center for Health Statistics. 1969, Series 10, No. 78, December, 1972.

Handicapped

The ITD study's focus on the handicapped population is for those individuals with physical, mental or emotional disabilities which restrict or preclude use of conventional private or public transportation facilities. These include:

- Non-ambulatory disabilities,
- Semi-ambulatory disabilities,
- Functional disabilities,
- Sight and Hearing disabilities, and
- Developmental disabilities.

For the severely handicapped individual, there are often numerous problems in addition to the specific handicap itself: advanced age, low income, and lack of specific work skills or education.

SCOPE OF ITD PROJECT

Analysis of BART's impacts conducted in each of the six major project areas of the BART Impact Program are applied in the investigation of a set of twenty-four specified issues related to a range of potential impacts of BART on the transportation disadvantaged. Issue investigations are being conducted in four broad impact areas; an interim technical memorandum or working paper is to be prepared reporting the results of study in each work element of the ITD study:*

* Urban Dynamics Associates. The Implications of BART's Environmental Impacts for the Transportation Disadvantaged. BART Impact Program. Document No. DOT-BIP-TM 34-10-78. January, 1978.
Urban Dynamics Associates. The Implications of BART's Mobility and Accessibility Impacts for the Transportation Disadvantaged. BART Impact Program. (Draft Technical Memorandum). December, 1977.
Urban Dynamics Associates. The Implications of BART's Economic, Employment and Financial Impacts for the Transportation Disadvantaged. BART Impact Program. (Draft Technical Memorandum). December, 1977.
Urban Dynamics Associates. The Implications of BART's Land Use and Urban Development Impacts for the Transportation Disadvantaged. BART Impact Program. (Draft Working Paper). January, 1978.

- Environmental
- Mobility and Accessibility
- Economic, Employment and Financial
- Land Use and Urban Development.

Purpose of This Report

This is the second of four interim ITD reports examining the range of BART's impacts on the transportation disadvantaged. The overall objective of this report is to assess the extent of mobility and accessibility benefit which BART has provided these groups, and to determine if these impacts affect the transportation disadvantaged disproportionately — either greater or lesser travel service benefit than provided for the non-disadvantaged area traveler.

It is also the purpose of this report to identify the implications of the mobility and accessibility impacts of BART for the transportation disadvantaged. In order to draw these implications, a set of specific issue statements is examined using the best current information available from the BART Impact Program. During Phase I of the ITD study, a number of mobility issues were considered for inclusion within this report. After considerable review of completed and soon to be completed tasks within the six BIP project areas, a list of key mobility issues was developed and is employed in this report as the focus of analysis. These five issues are investigated in Chapter II: "Investigation of Mobility and Accessibility Issues".

II. INVESTIGATION OF MOBILITY AND ACCESSIBILITY IMPACT ISSUES

In order to determine the implications of BART's mobility and accessibility for the transportation disadvantaged, five specific issues have been designated for investigation using information developed in the BART Impact Program; other BART studies; and primary population, employment and travel data sources where necessary.* The five mobility issues examined are:

1. Has BART improved accessibility to employment opportunities for the transportation disadvantaged?

2. Has BART provided ethnic minorities, handicapped and elderly with improved access to the area's social, medical, cultural and recreational facilities and events?

3. What is the level and significance of BART use by ethnic minorities? Specifically, a) Are minority BART riders representative of the size and socio-economic composition of the service area minority population? b) Do minorities use the system less than one would expect? c) Are ridership rates from stations located in minority areas less than those located in non-minority areas? and d) What attributes of BART best explain the level of BART usage by minorities?

4. Has BART operation adversely affected minorities by causing reductions in AC transit and MUNI service in ethnic minority areas?

5. Has BART's potential benefit for the handicapped been realized with the provision of a largely barrier-free rapid rail facility?

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* Urban Dynamics Associates. Project Implementation Plan. BART's Implications for the Transportation Disadvantaged. September, 1977.

ISSUE NUMBER ONE

Has BART improved accessibility to employment opportunities for the transportation disadvantaged?

Overview: BART's Impact on Accessibility

The examination of BART's accessibility impacts in the BART Impact Program has utilized a number of different analyses to compare transit travel times and costs among the With-BART and No-BART Network Alternatives studies in the Transportation System and Travel Behavior Project (TSTB). A complete discussion of network alternative descriptions, travel time estimation techniques and procedures for area and selected subarea analysis, can be found in TSTB's: Working Note WE. VI-2.* For the purpose of this issue investigation, average peak hour transit travel times weighted by actual total travel are compared between the With-BART systems and No-BART Alternative for travel from all zones of the Greater BART Service Area (GBSA)** to a set of 50 zones representing the locations of the Bay Area's major employment opportunities.*** This analysis is supplemented by examination of comparative travel times to the San Francisco, Oakland and Berkeley downtown areas.

The two networks used in the analysis may be defined:

- With-BART Transit Network:
  A representation of the entire 1976 transit system including BART, its bus feeder services, and all other bus and streetcar services in the area.

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* Peat, Marwick, Mitchell & Co. Comparison of Travel Times From With-BART, No-BART and Highway Networks. (Working Note: Work Element VI-2). October, 1977.

** GBSA: 239 zones representing the area served by BART: San Francisco, Alameda, Contra Costa Counties and northern portion of San Mateo County.

*** The 50 zones of the Greater BART Service Area with the highest "total employment" as estimated by ABAG: Provisional Series Three Projections. March, 1977.

- No-BART Transit Alternative (NBA):
  A representation of a hypothetical 1976 transit system, which has been selected by MTC for comparative analytic purposes and judged to be the most likely to have developed in the BART area if BART had not been built. It represents a transit system providing a much lower level of transit service than the With-BART network since it assumes that only minor improvements in the bus system existing in 1971, prior to BART, would have occurred if BART had not been built.

In the discussion of BART's impact on accessibility, it should be noted that the No-BART transit network alternative is only one of many possible area transit alternatives that could be hypothesized. Since the NBA represents a transit system with a lower level of total transit services and due to possible travel time estimation errors, one possible effect of the analysis may be to overstate BART's actual impact on accessibility. Due to this and other technical problems inherent in the complex accessibility modeling procedures used in the TSTB Project, the reliability of the analysis is generally restricted to findings of the relative impact of BART on gross area travel patterns.

Impact on Ethnic Minorities

Comparison of average trip times from all zones in the BART Service Area for the With-BART and the No-BART alternatives shows that BART's impact is to reduce average travel times to the selected top 50 employment zones by 5.4 minutes, or 11.9 percent travel time savings. As shown in Table 1-1, the downtown areas of San Francisco, Oakland and Berkeley are nearly equivalent in total average travel times in the With-BART network. However, the comparative transit travel times suggest that BART has had somewhat more of an impact on the improved accessibility of the East Bay CBD areas.

Table 1-2 shows that the greatest accessibility improvement to employment opportunities due to BART has been from the suburban residential areas with the lowest proportion of ethnic minority residents. It is clear that BART's accessibility impact is greatest for commuters living in the outlying suburban areas distant from the central employment centers. While transit travel times are substantially improved with BART in the Fremont Corridor, with a relatively high ethnic minority population, transit travel times remain relatively high. Also, they do not compete as well

Table 1-1

AVERAGE PEAK PERIOD TRAVEL TIMES TO SELECTED EMPLOYMENT ZONES: COMPARISON BETWEEN WITH-BART AND NO-BART NETWORKS
Origins: All 239 Zones in BART Service Area

Selected Zone	Employment Area	Weighted Average Trip Times			
		No-BART Minutes	With-BART Minutes	Difference	Percent Difference
129	Berkeley CBD	40.3	32.6	7.7	19.1%
144	Oakland CBD	41.0	33.4	7.6	18.5
422	San Francisco CBD	35.6	31.4	4.2	11.8
Top 50 Employment Zones		45.6	40.2	5.4	11.8%

Source: Peat, Marwick, Mitchell & Co. Comparison of Travel Times From With-BART, No-BART and Highway Networks. (Working Note: Work Element VI-2). October, 1977.

Table 1-2

COMPARISON OF CORRIDOR TRANSIT ACCESSIBILITY TO 50 EMPLOYMENT ZONES WITH BART AND NO BART ALTERNATIVE: PROPORTION OF ETHNIC MINORITY RESIDENTS

Origins: BART Corridor	Accessibility Improvement With-BART Rank Order[a]	Average Travel Times to Top 50 Employment Zones[b], Minutes (Selected Origin Zone[c])	With-BART	No-BART Alt.	Percent Corridor (PBSA) Population Non-White[d]	Percent Population Using BART[d]
Fremont	1	(203)	56.1	102.7	34.9%	2.3%
Concord	2	(99)	49.0	60.3	7.5	4.5
Daly City	3	(363)	49.5	60.2	44.8	3.3
Richmond	4	(118)	41.1	42.7	35.4	2.9
Oakland	5	(138)	27.9	29.6	48.0%	3.2%

[a] Source: John Blayney Associates and David M. Dornbusch & Co., Inc. Accessibility Mapping. BART Impact Program. Document No. DOT-BIP-WP 36-5-77. Metropolitan Transportation Commission, Berkeley. September, 1977.

[b] Source: Peat, Marwick, Mitchell & Co. Comparison of Travel Times From With-BART, No-BART, and Highway Networks. BART Impact Program. (Working Note: Work Element VI-2). Metropolitan Transportation Commission, Berkeley. October, 1977.

[c] Average transit travel times from all origin zones in each corridor have not been tabulated in the TSTB Project. Selected zones shown in table are intended to illustrate level of accessibility gains provided by BART to employment centers from each corridor.

[d] Source: Peat, Marwick, Mitchell & Co. Demography of Areas Served By BART. BART Impact Program. (Working Note: Work Element IV-6). Metropolitan Transportation Commission, Berkeley. October, 1977.

with auto travel times as With-BART transit travel times do in the Concord Corridor.

The Transportation System and Travel Behavior Project has conducted a series of analyses to assess the potential travel time savings that BART implies for various population subgroups.* This study found that transit travel times to downtown San Francisco differ very little between the With-BART and No-BART alternatives for households with incomes below the poverty level ($4,000 in 1969). For this low income group, transit travel times to downtown San Francisco are reduced by an average of 7 minutes (-15%), compared to 13 minutes (-21%) for the total population. The same minimal transit travel times savings for the non-White and elderly population is observed in this analysis.

Since BART offers the greatest accessibility benefits to the long distance commuter to the downtown areas of San Francisco, Oakland and Berkeley, it is not surprising that BART's impact on improved accessibility to employment in these areas has not been substantial for ethnic minority persons who are more likely to live in more central locations better served by bus and streetcar transit. Additionally, with the exception of the Asian population working in the San Francisco CBD area, employment opportunities for ethnic minorities in the most accessible downtown areas are fewer than in other parts of the Bay Area. The rate of ethnic minority employment in the areas best served by BART is provided by data collected in a survey of employees working in a set of the 88 employment zones of the BART service area which contains workplaces that are readily accessible to BART.** Employee and work trip characteristics were analyzed in the study in order to analyze BART's impacts on regional work-related travel. Within the total workplace study area, it is estimated that there are 505,977 employees from which a sample of 8,391 usable surveys were obtained for the analysis of travel characteristics. As shown in Table 1-3, Blacks represent 11.8 percent of the total employment of the Workplace Survey

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* PMM & Co. Analysis of BART's Accessibility Impacts. (Working Note). December, 1976.

** Peat, Marwick, Mitchell & Co. Analysis of 1977 Workplace Survey. Draft Working Note. December, 1977.

Table 1-3

RATE OF EMPLOYMENT AND BART USE AS PRINCIPAL MODE OF TRAVEL TO WORK: WORKPLACE SURVEY AREA, SAN FRANCISCO AND OAKLAND CBD'S

Ethnic Category	Percent Population of Greater BART Service Area[a]	Percent Total Employment[b]		
		BART Workplace Survey Area	San Francisco CBD	Oakland CBD
White	68.1%	62.0%	55.2%	69.0%
Black	11.8	11.8	8.0	11.9
Spanish heritage	12.7	9.3	8.5	5.2
Asian & Others	7.4	16.9	28.3	13.9
All Persons	100.0%	100.0%	100.0%	100.0%
	Share of Weekday Trips[c]			
Principal Mode				
BART	5.2	13.1	16.9	24.7
Drive Alone	65.6	52.8	28.4	44.4
Bus, Streetcar	17.7	17.3	35.2	16.4

[a] Source: PMM & Co. Demography of Areas Served By BART. (Working Note: Work Element IV-6). October, 1977.

[b] Urban Dynamics Associates and Metropolitan Transportation Commission: Tabulations: Workplace Survey File. Creation Date, October 25, 1977. Peat, Marwick, Mitchell and Company, Inc.

[c] Peat, Marwick, Mitchell & Company. Comparison of Travel Times From With-BART, No-BART and Highway Networks. (Working Note: Work Element VI-2). October, 1977.

Area, but only 8.8 percent of San Francisco CBD employment is Black. Similarly, in the Oakland CBD, which has a high accessibility by BART within the Fremont Corridor (18.3 percent Spanish-heritage), only 5.2 percent of total employment is Spanish-heritage. Compared to their representation in the GBSA population, Asians are over-represented in the total BART Workplace Survey Zones, Blacks equally represented, and Spanish-heritage under-represented.

The special case of BART's impact on accessibility to employment opportunities in outlying suburban areas is examined in Work Element 3.3 of the ITD Project.* It was anticipated that BART might have an impact on increasing the accessibility for low income and ethnic minority persons to the growing number of job opportunities which exist in the suburban areas. Of particular interest is the large ethnic minority population living in San Francisco who might be able to use BART to travel to blue-collar job opportunities in the East Bay. Analysis of Transbay travel shows that of the 2,300 daily "reverse-commuter" BART trips to the East Bay, 21 percent of these were made by non-Whites, compared to only 8 percent of transbay work travel to the West Bay. Despite this appreciably higher percentage of non-White travelers in the reverse commute direction, the total volume of these trips is fairly low and so is the absolute number of ethnic minority reverse commuters. One of the reasons for low BART use by blue-collar workers is that BART does not provide a high level of accessibility to industrial employment in the East Bay due to station locations, hours of operation and most importantly, because of the lack of adequate bus-egress services to workplace sites.**

Work Travel Mobility Versus Accessibility

Because of the complexity of travel behavior and because of limitations inherent in the analysis of BART's accessibility impacts, it is not surprising that BART ridership rates are not uniformly correlated with estimated accessibility improvements. Thus, while

* Urban Dynamics Associates. The Implications of BART's Economic, Employment and Financial Impacts on the Transportation Disadvantaged. (Draft Technical Memorandum). December, 1977.

** Jefferson Associates, Inc. Impacts of BART on Bay Area Institutions and Lifestyles. (Draft Final Report). May, 1977.

BART has generally not provided ethnic minorities in the aggregate with employment accessibility gains equivalent to the majority population, ethnic minority employees who are served by BART are using BART at higher rates than White employees who are served by BART. As shown in Table 1-4, nearly half of Black employees (45.4%) and Spanish employees (52.4%) working in the 88 zones of the BART Workplace Survey Area, who state they could use BART, do use BART as their principal mode of travel to and from work. In contrast, less than one-third (32.5%) of White employees in the Workplace Survey Area who could, do use BART.

As noted previously and indicated in Table 1-3, Blacks and Spanish-heritage persons tend to be under-represented in the employment centers of the most accessible downtown areas. But the ethnic minority employees who do work in these areas are more likely to be lower wage earners, women and holders of lower-status jobs. These groups are more likely to be transit dependent and therefore utilize public transportation which serves their home-to-work travel needs. Table 1-5 shows clearly this pattern of greater transit dependency among ethnic minority workers in the San Francisco downtown. For example, over two-thirds (67.4%) of Black employees in the San Francisco CBD are female and 60.4 percent are clerical workers.

A greater use of public transportation, both BART and conventional transit, is evident among the more transit dependent categories of employees in the Workplace Survey Area as displayed in Table 1-6. However, for these employee subgroups, BART is relied upon proportionately less than bus or streetcar as a principle mode of travel to and from work than it is by professionals, upper income and male employees.

Conclusion

BART's overall impact on accessibility to employment centers in the Bay Area has been relatively modest for the region as whole. The most substantial improvements in transit travel time savings have been for commuters from outlying suburban residential areas to the downtown areas of San Francisco, Oakland and Berkeley. Correspondingly, the greatest work accessibility benefits have accrued to Whites, and upper income households who are both more likely to live in the outlying residential areas served by BART and more likely to be employed in the CBD areas with highest access to BART.

Table 1-4

PROFILE OF BART USE FOR WORK TRIP BY ETHNIC CATEGORY
(Workplace Survey Area*)

Ethnic Category	Workplace Survey Area Employment	Percent Who Could Use BART	Percent BART Principal Mode	Percent BART Principal Mode who could use BART	Percent BART Principal Mode With No Second Choice
White	293,022	34.9%	11.4%	32.7%	15.3%
Black	55,513	31.5	14.3	45.4	25.8
Spanish	44,093	32.2	16.9	52.4	35.5
Asian	70,021	30.2	13.1	43.3	28.4
Others	9,786	32.2	14.4	44.7	33.7
TOTAL	472,436	33.5%	12.6%	37.5%	21.7%
Missing Cases	33,541				
	505,977				

* The 88 zones of the 239 Zone Greater BART Service Area judged to be readily accessible to BART.

Source: Peat, Marwick, Mitchell & Company. Tabulations Workplace Survey File. Creation Date: October 25, 1977.

Table 1-5

SELECTED SOCIO-ECONOMIC CHARACTERISTICS
OF EMPLOYEES IN SAN FRANCISCO CBD
BY ETHNIC GROUP

Characteristic of Employee	Percentage of Ethnic Group in Each Category	
Employment Type	Professional Manager	Clerical
White	19.9%	41.5%
Black	2.6	60.4
Spanish	3.7	62.4
Asian	13.5	45.8
Income	Above $25,000	Below $10,000
White	34.2%	16.4%
Black	14.0	32.9
Spanish	13.5	29.5
Asian	16.0	34.4
Sex	Male	Female
White	48.6%	51.4%
Black	32.8	67.4
Spanish	39.2	60.8
Asian	47.9	52.1

Source: Urban Dynamics Associates, Metropolitan Transportation Commission. Tabulations of Workplace Survey File. Creation Date: October 25, 1977. Peak, Marwick, Mitchell and Company, Inc.

Table 1-6

PRINCIPAL MODE OF TRAVEL TO WORK
IN WORKPLACE SURVEY AREA

Characteristic of Employee	Percentage Employee Group Using Travel Mode to Work	
Employment Type	Professional Managers	Clerical
BART	12.7%	16.1%
Bus, Streetcar	13.1	27.1
	26.8%	43.2%
Income	Above $25,000	Below $10,000
BART	12.4%	14.0%
Bus, Streetcar	12.7	28.8
	25.1%	42.8%
Sex	Male	Female
BART	9.8%	15.7%
Bus, Streetcas	11.2	24.9
	21.0%	40.6%

Source: Urban Dynamics Associates, Metropolitan Transportation Commission. Tabulations of Workplace Survey File. Creation Date: October 25, 1977. Peat, Marwick, Mitchell and Company, Inc.

Based on analysis of transbay travel, there is some indication that BART offers increased accessibility to East Bay job opportunities for ethnic minorities and low income persons living in San Francisco. However, industrial employment centers do not have a high degree of access to BART, either in terms of proximity or adequate bus-egress service. Consequently, BART has not yet provided a significant improvement in the accessibility to blue-collar employment for ethnic minority individuals or low-income households. Although BART has slightly improved job accessibility for the transportation disadvantaged, it constitutes a relatively minor factor in the overall nexus of social, political and economic factors which shape employment opportunities for this population subgroup.

Despite the fact that lower work accessibility gains have been achieved for ethnic minority employees with the introduction of BART, for those residents of the area for whom BART is a possible work travel alternative the rate of BART use as the principle mode of travel to and from work is somewhat higher among ethnic minorities than it is for the White majority. This reflects greater overall dependency on public transportation services and suggests a shift in travel mode choice, not a major increase in work-related mobility for ethnic minorities.

ISSUE NUMBER TWO

Has BART provided ethnic minorities, the handicapped and the elderly with improved access to the area's social, medical, cultural and recreational facilities and events?

BART's Non-Work Related Travel and Accessibility Impacts

In the investigation of Issue Number One, it was found that BART's greatest accessibility improvement for transit travel in the BART Service Area was for peak-hour travel from outlying suburban areas to the downtown employment centers in San Francisco, Oakland and Berkeley. This is reflected in mobility patterns since over two-thirds of BART's total all day trips (66.8%) are to or from work.* It was also concluded in the discussion of work accessibility impacts that BART provides lower accessibility gains to employment opportunities for the transportation disadvantaged than it does for the general population.

One indicator of BART's accessibility impacts for non-work related travel opportunities is the analysis of improvement in average transit travel times for off-peak travel from all zones in the Greater BART Service Area to the Top 50 Shopping Zones. It should be noted that this comparison of differences in average travel times between the With-BART and No-BART transit networks requires the same caveats as discussed in Issue One. Table 2-1 shows a slight accessibility improvement for average off-peak transit travel times to and from the Top 50 Shopping Zones With-BART over No-BART — a 6.4 minutes or 15.7 percent travel time savings. Examination of travel time differences from selected origin zones with varying proportions of ethnic minority population suggests that for off-peak, non-work related travel, BART's accessibility gains are less for minorities than for the majority population. Apparently, this is in part true due

*PMM & Co. Travel in the BART Service Area. Document No. DOT-BIP-WP 35-3-77. September, 1977.

Table 2-1

AVERAGE OFF-PEAK TRAVEL TIMES FROM SELECTED RESIDENTIAL ZONES TO TOP 50 SHOPPING ZONES IN BART SERVICE AREA

Selected Zone Number	Residential Origin	Percent Total Ethnic Minority[b]	Weighted Average Trip Times[a]			
			No-BART Minutes	With-BART Minutes	Difference	Percent Difference
99	Walnut Creek	8.5%	70.6	31.6	39.0	55.2%
363	Daly City	53.2	64.2	44.8	19.4	29.9
120	El Cerrito	15.5	31.4	26.8	4.6	14.6
138	Oakland MacArthur	77.3	20.5	20.9	-0.4	-2.0
118	Richmond	45.6	35.6	41.4	-5.8	-16.2
ALL ZONES	GREATER BART SERVICE AREA (Average)	31.9%[c]	40.6	34.2	6.4	15.7%

[a] Estimated off-peak travel times weighted by estimated number of zone to zone shopping trips.

[b] Percent total ethnic minority of total 1970 population living within one-half mile of station.
Source: McGuire, Chester. Who Are the Transportation Disadvantaged? BART Impact Program. Document No. WP 27-10-77. April, 1976.

[c] All zones within GBSA, not just within one-half mile of stations.

Source: Peat, Marwick, Mitchell & Co. Comparison of Travel Times From With-BART, No-BART, and Highway Networks. (Working Note: Work Element VI-2). October, 1977.

to lower average transit travel times for either alternative transit network from origins within the closer-in, more central areas in which ethnic minorities live in the highest concentrations.

Actual travel patterns reflect the degree of mobility benefits provided by BART for access to the areas educational, medical, cultural and recreational opportunities. Table 2-2 displays the proportion of areawide weekday travel by each principal travel mode for general trip purposes. While BART's share of total work travel in the area is 5.2 percent (23% of total transit), its share of non-work related travel is substantially less — 2.9 percent of school (13% of total transit), 0.6 percent of shopping (11% of total transit), and 0.8 percent of "other purposes", including recreation, visiting and personal business (11% of total transit).

These aggregate areawide data, collected in May of 1975, show that BART's mobility impact on access to non-work related community opportunities is relatively modest for educational purposes, and negligible for other purposes. This conclusion could be modified if comparable data were available for the period since BART has initiated weekend and evening service. There is no evidence that this overall conclusion of only slight mobility benefit provided by BART for non-work related travel, does not apply to the transportation disadvantaged population subgroup of the BART Service Area. The only apparent exception to this generality may be a slightly higher rate of BART use for the school trip among ethnic minority students. *

Educational Opportunities

There are a large number of non-residential colleges and universities in the Bay Area to which many students must commute. Consequently, it was anticipated that BART would provide a substantial improvement in access to these institutions of higher learning for all commuting students, including ethnic minority and disabled students. The findings of the Institutions and Lifestyles Project

* No travel data for trip purpose by ethnic group on bus or streetcar are available.

Table 2-2

MODE AND PURPOSE OF TRAVEL
(Total Trips Made in Vehicles Monday through Friday, May 1975)

Trip Purpose	Mode of Travel				
	BART	Automobile Driver[a]	Automobile Passenger	Bus or Streetcar	Total All Modes
Work	381,000	4,779,000	838,000	1,291,000	7,289,000
	5.2%	65.6%	11.5%	17.7%	100.0%
Business	33,000	1,462,000	108,000	93,000	1,696,000
	1.9%	86.2%	6.4%	5.5%	100.0%
School or College	77,000	1,798,000	325,000	494,000	2,654,000
	2.9%	66.2%	12.3%	18.6%	100.0%
Shopping	29,000	3,788,000	777,000	230,000	4,824,000
	0.6%	78.5%	16.1%	4.8%	100.0%
Other Purposes[b]	68,000	5,926,000	1,702,000	521,000	8,217,000
	0.8%	72.1%	20.7%	6.4%	100.0%
Number of Trips Represented	588,000[c]	17,713,000	3,750,000	2,629,000	24,680,000
Percent of Trips Represented	2.4%	71.8%	15.2%	10.6%	100.0%
Unweighted Sample Size	9,698	1,183	262	192	

[a] Includes "other" modes, largely pickup trucks and other commercial vehicles. A total of 834,000 weekday trips per week are made by these modes.

[b] The other purposes category includes recreation trips, trips to visit friends or relatives, and personal business trips.

[c] Average number of weekday BART trips per week, May 1975.

Sources: BART Impact Program May 1975 Areawide Travel Survey. 1975 BART Passenger Profile Survey. Peat, Marwick, Mitchell & Co. Travel in the BART Service Area. BART Impact Program. Document No. DOT-BIP-WP 36-3-77. Metropolitan Transportation Commission, Berkeley. September, 1977.

indicate that BART's impact to date has not been great, either on the campus planning of these institutions of higher learning or on the lifestyle patterns of students.* University student use of BART to and from school for those institutions where travel data are available was found to range from 6.5 percent (City College of San Francisco) to 16 percent (Golden Gate College, City of San Francisco) of all student travel to and from campus. The greatest impact of BART appears to be for the University of California, Berkeley and its students. This institution has achieved a "pedestrian-oriented" campus with a high level of barrier-free accessibility for disabled students. There is evidence that BART is used by some of the relatively large group of handicapped students at the University of California, Berkeley to commute to school.** While many students live within walking distance of the campus and consequently only a relatively small number commute, 8 percent of the students use BART to and from campus. Laney College, with a high proportion of Black students, has good access to BART since its campus is directly adjacent to the Lake Merritt station. Unfortunately, there are no data on the travel patterns of these students.

BART's impact on the lifestyles of university students appears to be modest, but is primarily to support the areas pattern of commuting to campus. BART, in addition to other public transportation, allows the lower-income, more transit dependent student to live at home with parents, thus minimizing the total costs of higher education.

Medical Care

The analysis of the BART Passenger Profile 1976 (PPS76) data conducted by the Transportation System and Travel Behavior Project does not provide sufficient detail in the identification of "other" trip purposes to provide for a meaningful analysis of medical-related

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* Jefferson Associates, Inc. Impacts of BART on Bay Area Institutions of Higher Education and Their Students. Document No. DOT-BIP-TM 31-6-7. May, 1977.

** Jefferson Associates, Inc. Special Groups Mobility Analysis. Document No. WN 15-3-75. August, 1975.

trips made on BART. A special tabulation of the PPS76 data indicates that of the 8,985 trips sample, 147 were trips to medical, dental, clinic or hospital facilities.* This represents approximately 1.6 percent of the BART trips sampled. The small size of the medical-related travel sub-sample does not permit statistically reliable stratification by ethnic category.

A study of BART's use by patients of Bay Area health care institutions reveals that BART has not provided any substantial improvement in access to health care facilities for the transportation disadvantaged.** In a survey of patients at five hopsitals in the BART Service Area, less than one percent (0.9%) were found to use BART to get to the hospital compared to 7.7 percent who used bus or streetcar. Less than one-tenth of those patients who said BART was available for the trip actually used it, as opposed to nearly half of those who could use local transit who actually did use bus or streetcar. The predominant mode of access to all hospitals is the automobile.

Given the negligible use of BART by patients, it is difficult to detect variation between the majority and minority populations. However, facilities whose patients include lower income and ethnic minority individuals showed greater levels of expressed transportation dependency, lower rates of automobile use, and higher levels of public transportation use, including BART.

Cultural and Recreational Opportunities

The analysis of BART's impact on overall non-work related accessibility indicated that, in the aggregate, BART has had only negligible impact on recreational, social and cultural patterns within the Bay Area; less than one percent share of "other purpose" areawide travel. For those using public transportation for these travel purposes, eight times as many use bus or streetcar as use BART.

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* Passenger Profile Survey, 1976. File WT. Metropolitan Transportation Commission.

** Jefferson Associates, Inc. Impacts of BART on Bay Area Health Care Institutions. Document No. DOT-BIP-TM 22-6-7.

Field observations and reports of BART patronage levels on holiday or other special event promotions undertaken by BART allow a few inferences to be drawn regarding BART's potential and actual impact on increased recreational and cultural accessibility.* Principal activities served by BART are athletic and other events at the Oakland Coliseum, holiday promotions such as Labor Day, and cultural events in the city centers of Oakland and San Francisco. Most of the BART riders to these events are traveling in groups, frequently one or more parents with children. However, events to the Coliseum which attract the largest BART ridership are ones which appeal principally to youth, many of whom would not attend by car without BART. Interviews conducted at the Oakland Coliseum during the "BART Goes to the Circus" promotion found that most of those using BART to attend the event probably would have come by auto if BART were not operating. This limited information suggests that a substantial share of BART's use for recreational travel may be a relatively non-transit dependent segment of the population.

A slightly lower level of BART use for "other trip purposes" by ethnic minority patrons observed in the 1976 Passenger Profile Survey** supports the general inference that the transportation disadvantaged have not, as of yet, benefited to the extent that the general population has benefited from BART's improved access to area recreational and cultural events. This is, of course, not only related to characteristics of BART service, but also to the lower-income status of the transportation disadvantaged and the costs of many of these activities. There are, however, indications that a sizeable latent demand for recreational use of BART exists, and that with weekend and full service levels BART's recreational use could increase dramatically, especially if a group discount fare policy were to be adopted.

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* Jefferson Associates, Inc. Impacts of BART on Bay Area Institutions and Lifestyles. (Draft Final Report). May, 1977.

** See Table 3-6, Page II-30.

Conclusion

Analysis of BART's impact on off-peak transit travel times indicates that BART has contributed slightly to greater accessibility for non-work related activities in Bay Area for the general population, and to a lesser extent, for ethnic minorities. Actual use of BART for these purposes remains at a relatively low level compared to bus and streetcar, as well as the automobile. While relatively small, BART has had its principle non-work related activity impact on travel to and from educational institutions. There is no evidence that this has benefited ethnic minorities to a greater or lesser extent than the total student population. Access to medical care facilities has not been measurably affected by BART for either the majority population or the transportation disadvantaged. Increased benefits of BART for social, cultural and recreational activities could be expected, particularly for the transportation disadvantaged, with implementation of full service levels, weekend service, and a group discount fare policy.

ISSUE NUMBER THREE

What is the level and significance of BART use by ethnic minorities? Specifically, a) Are minority BART riders representative of the size and socio-economic composition of the service area minority population? b) Do minorities use the system less than one would expect? c) Are ridership rates from stations located in minority areas less than those located in non-minority areas? and d) What attributes of BART best explain the level of BART usage by minorities?

Representativeness of Ethnic Minority BART Ridership

- Level of BART Ridership: Greater BART Service Area

  There are a number of problems in estimating group-specific BART ridership rates by comparing the composition of BART ridership with that of the area's population. The best approach relies on comparative analysis of the 1976 BART Passenger Profile Survey (PPS76) with the characteristics of the estimated 1975 population aged 16 years and older of the Greater BART Service Area (GBSA).* The PPS76 data used as the basis for this discussion were collected in May, 1976 during the daytime period beginning at 6:00 AM and ending at 3:00 PM.** Over 90 percent of the survey responses were from travelers making half of a round trip on BART. Because of this symmetry in the data, faregate counts could be used to expand the sample of 8,142 questionnaires returned up to total ridership for the day of the survey (124,000 trips between 6:00 AM and midnight).

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*GBSA: San Francisco, Alameda, and Contra Costa Counties and the northern part of San Mateo County.

**A complete description of how the survey was conducted and how the data were processed is found in: 1976 BART Passenger Profile Survey: Field Methods and Processing Procedures. Data Document. Metropolitan Transportation Commission. September, 1976.

Weighting factors were applied to the data to reflect differences in sampling and response rates by station, time of day and by ethnic category. Based on interviewer-identification of respondents, estimated response rates by ethnic category were computed and used to expand the minority sample responses given lower response rates than obtained from White travelers. While these weighting procedures may be considered the best method available to estimate actual minority BART ridership distribution, the margin of error which exists in the estimations is unknown and potentially problematic for this analysis.

The PPS76 sampled BART travelers of high school age or older. A comparison of this ridership with the population aged 16 years of age or older in the Greater BART Service Area (GBSA) indicates that total ethnic minority ridership on BART is slightly less (27.3%) than the proportion of the estimated 1975 ethnic minority population aged 16 years or older in the Greater BART Service Area (29.7%). The lower rate for total ethnic minority ridership is accounted for by a substantially lower rate of BART ridership by the Spanish-heritage population of the GBSA. As shown in Table 3-1, Whites and Blacks use BART to an extent approximating their representation in the service area population. The rate of BART ridership among the Asian population is significantly greater than the area average.

- Socio-Economic Profile: Ethnic Minority BART Users and Area Population

In order to analyze the representativeness of BART's ethnic minority ridership, it is necessary to compare certain key socio-economic profile characteristics between BART users and the area population.

Income: Table 3-2 shows the estimated 1975 household income distribution of the Black, Spanish-heritage and "Other" (predominantly White, including Asian) population of the Three County BART Service Area. This table reveals that in comparison to the area population in each ethnic category, Black riders of BART are generally higher-income, White and Other riders are more representative, and Spanish-heritage riders are generally lower-income. However, compared to White BART users, both Black and Spanish-heritage ridership distributions are characterized by lower incomes.

Table 3-1

RATE OF DAILY BART USE IN THE GREATER BART SERVICE AREA*
BY ETHNIC CATEGORY (DAILY BART TRIPS PER 100 POPULATION
16 YEARS OF AGE OR OVER)

Ethnic Category	Total Daily BART Trips[a] Percent	Number	Estimated 1975 Population[b] Greater BART Service Area (16 years or older) Percent	Number	Rate Per 100 Persons (16 years or older)
White	72.7%	96,000	70.3%	1,324,100	7.25
Black	11.2	14,800	10.7	201,500	7.34
Spanish-heritage	5.9	7,800	11.4	214,700	3.63
Asians & Others	10.2	13,500	7.6	143,200	9.43
TOTAL	100.0%	132,000[c]	100.0%	1,883,500	7.00

* Greater BART Service Area (GBSA): San Francisco, Alameda, Contra Costa Counties and the northern portion of San Mateo County.

[a] Source: PMM & Co. Travel in the BART Service Area. Document No. WP 35-3-77. September, 1977. Passenger Profile Survey 1976. Weighted by Ethnic Category for differential response rates.

[b] Source: PMM & Co. Demography of Areas Served By BART. (Working Note: Work Element IV-6). October, 1977; and population estimates developed by staff of the Metropolitan Transportation Commission.

[c] Estimated average BART daily ridership in May, 1976. Peat, Marwick, Mitchell & Co. BART Impacts on Highway Traffic and Transit Ridership. BART Impact Program. Document No. TM 20-3-76. May, 1977.

Table 3-2

COMPARISON OF HOUSEHOLD INCOME DISTRIBUTION BY ETHNICITY:
THREE COUNTY BART SERVICE AREA POPULATION VERSUS BART USERS

	1975 Population Estimate[a]			BART Users - Daytime[b]		
	Black	Spanish	White & Other[c]	Black	Spanish	White & Other[c]
1. Under $7,000	32.8%	17.8%	12.9%	20.2%	17.7%	15.2%
2. $ 7,000 to $ 9,999	15.2	11.2	8.3	19.0	21.1	10.0
3. $10,000 to $14,999	22.0	22.6	17.4	20.6	24.9	17.3
4. $15,000 to $24,999	27.3	33.5	36.7	24.8	26.7	31.7
5. Over $25,000	2.7	14.9	24.7	15.3	9.5	25.8
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

[a] Source: 1970 U.S. Census of Population: General Social and Economic Characteristics. Adjusted distribution to estimate 1975 family incomes using transition factors utilized in the Transportation System and Travel Behavior Project. Peat, Marwick, Mitchell & Co. Travel in the BART Service Area. Document Number WP 35-3-77. September, 1977. Appendix C.

[b] Passenger Profile Survey 1976. File WX. Daytime Survey (6:00 AM to 3:00 PM). Crosstabs: Urban Dynamics Associates.

[c] Other: Total persons minus Blacks and Spanish. Includes Asians, but is predominantly White.

Education: Table 3-3 shows that BART riders tend to have higher levels of education than the population of the service area as a whole. Over forty percent (40.8%) of BART riders have four or more years of college compared to only 15.4 percent of the total population aged 25 years or older.* The number of BART users with four or more years of education within each ethnic minority group exceeds that of the population average.

Sex: It is also evident from Table 3-3 that females constitute a substantially larger proportion of ethnic minority riders than females do of White BART users. This is one indication that a larger segment of the ethnic minority BART ridership is a relatively transit dependent group, more so than is true of White BART trip-makers.

Age: While only 27 percent of the population in 1975 is estimated to be between the ages of 18 and 34, 59 percent of BART's ridership is in this younger age range. The proportions of Asian (74%), Black (70%) and Spanish-heritage (63%) BART passengers in this age interval is also high and somewhat greater than that among Whites (56%).

Transit Dependency: Comparison of income, age and sex characteristics of ethnic minority BART riders with White riders of BART indicates a greater level of transit dependency among minority BART travelers. That ethnic minority BART users are more transit dependent is also reflected by the fact that while 39 percent of White BART users report bus or streetcar as their previous mode of travel, 56 percent of Black, 53 percent of Spanish-heritage and 48 percent of Asians switched from bus or streetcar to BART, as shown in Table 3-4. Of BART users surveyed, approximately one-half of both Black and Spanish-heritage riders report no auto available as an alternative mode (52.6% and 46.7%, respectively), while only 36.2% of White riders indicate no auto was available for the trip made by BART.

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*The comparison of education levels is complicated by the fact that the census distribution is only for those 25 years and older, while the BART ridership distribution is for all those 16 years and older.

Table 3-3

EDUCATION LEVEL AND SEX OF BART RIDERS BY ETHNIC GROUP

Characteristic of Individual	May, 1976 BART Ridership: Daytime (6:00 AM to 3:00 PM)					1970 Greater BART Service Area Population
	Asian	Black	Spanish-heritage	White	All BART Riders	
Education Level						
High School or Less	15.7%	23.1%	36.3%	18.2%	19.8%	68.9%[a]
Four or More Years College	43.0	23.4	22.9	44.7	40.8	15.4 [a]
Sex						
Male	46.1%	43.4%	46.6%	56.2%	51.5%	48.9%[b]
Female	53.9	56.6	53.4	43.8	48.5	51.1 [b]

[a] Population twenty-five years of age or older. 1970 U.S. Census of Population and Housing.
[b] Peat, Marwick, Mitchell & Co. BART's First Five Years: Transportation and Travel Impacts. (Draft Final Report). December, 1977. Table 4.

Source: 1976 Passenger Profile Survey (weighted). All riders high school age or older. Jefferson Associates, Inc. BART Impacts on Travel by Ethnic Minorities. BART Impact Program. Document No. DOT-BIP-TM 33-3-77. Metropolitan Transportation Commission, Berkeley. November, 1977. Table 5.

Table 3-4

SUMMARY OF BART TRIP CHARACTERISTICS
BY ETHNIC CATEGORIES

Trip Purposes By Ethnic Category
(Weighted Percentages of Total Daytime Travel By BART Riders)

Trip Purpose	White	Black	Spanish Heritage	Asian
Work	59%	62%	61%	57%
Business	4%	2%	2%	2%
School	10%	15%	12%	17%
Personal Business	12%	8%	13%	12%
Other	15%	13%	13%	12%
Percent of Trips Represented	72.7%	11.2%	5.9%	8.4%

Areas of Travel By Ethnic Category
(Weighted Percentages of Total Daytime Travel By BART Riders)

Travel Area	White	Black	Spanish Heritage	Asian
Within East Bay	33%	35%	30%	25%
Within West Bay	22%	27%	44%	36%
Transbay	45%	38%	26%	39%

Previous Travel Modes of BART Riders By Ethnic Category[a]
(Weighted Percentages of Total Daytime Travel)

Previous Modes	White	Black	Spanish Heritage	Asian	No. of Trips Rep.
Bus	39%	56%	53%	48%	20,700
Car	59%	41%	43%	50%	26,800
Walk/Other	2%	3%	4%	1%	1,100

[a] Includes only those travelers who made the same trip before BART.

Source: 1976 BART Passenger Profile Survey and Peat, Marwick, Mitchell & Co., Survey Analysis of Travel By Automobile, Bus and BART, December, 1976.

Ethnic Minority BART Ridership: Expectations

Since BART was designed principally to serve peak-hour, long distance work trips to the downtown centers from the outlying suburban residential areas of the region, it is not surprising that ethnic minority ridership on the system is not higher than it is. Also, since ethnic minorities make fewer total trips it might be expected that ridership on a new travel mode introduced into the transportation system would reflect this lower rate of trip-making. On the other hand, due to the fact that many stations are located in predominantly minority neighborhoods and since there exist higher levels of dependency on public transportation among the minority population, relatively high rates of minority use might also have been expected.

- Ridership Rates in the Primary BART Service Area

  The Primary BART Service Area (PBSA) is the subset of travel zones in the Greater BART Service Area, which accounts for approximately 80 percent of all BART trip origins and 62 percent of the GBSA population.* Within this more immediate service area, both Black and Spanish-heritage persons live in greater population concentration than in the GBSA as a whole. Table 3-5 compares the ethnic distribution of the PBSA population 16 years of age and older with the estimated distribution of BART tripmakers with PBSA origins. This analysis indicates that the daily BART trip-making rate per 100 PBSA population is significantly lower for the Black population (7.7) within this area than it is for the White population (9.8), and substantially lower for the Spanish-heritage population of the PBSA (4.3).

- BART's Share of Transit Travel by Ethnic Minorities

  Table 3-6 is based on the TSTB Project Analysis of the May 1975 BART Passenger Profile Survey and the 1975 Areawide Travel Survey conducted in the BART Impact Program.** Estimated weekly

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* Peat, Marwick, Mitchell & Co. Determination of BART's Service Area. (Working Note: Work Element IV-6). September, 1977.

** Peat, Marwick, Mitchell & Co. Travel in the BART Service Area. Document No. DOT-BIP-WP 35-3-77. Metropolitan Transportation Commission, Berkeley. September, 1977.

Table 3-5

RATE OF DAILY BART USE IN THE
PRIMARY BART SERVICE AREA*
(Daily BART Trips per 100 Population 16 Years of Age and Over)

Ethnic Category	Primary BART Service Area Daily BART Trips[a] Percent	Number	Estimated 1975 Population[b] Primary BART Service Area Percent	Number	Rate Per 100 Persons (16 yrs. or Older)
White	72.7%	76,800	67.1%	785,400	9.8
Black	11.2	11,800	13.0	152,500	7.7
Spanish-heritage	5.9	6,200	12.3	143,500	4.3
Asian and Others	10.2	10,800	7.6	80,400	12.1
TOTAL	100.0%	105,600	100.0%	1,170,800	9.0

* Primary BART Service Area (PBSA): The 132-zone area of the 239-zone GBSA which accounts for an estimated 80 percent of all BART origins and 62 percent of the GBSA population.

[a] Source: PMM & Co. Travel in the BART Service Area. Document No. WP 35-5-77. September, 1977. Passenger Profile Survey 1976. Weighted by Ethnic Category for differential response rates. Figures assume same ethnic distribution of PBSA BART Trip as GBSA.

[b] Source: PMM & Co. Demography of Areas Served By BART. (Working Note: Work Element IV-6). October, 1977; and population estimates developed by staff of the Metropolitan Transportation Commission.

Table 3-6

TOTAL VEHICLE TRIPS PER SEVEN-DAY WEEK
BY TRAVEL MODE AND ETHNIC CATEGORY
FOR POPULATION 16 YEARS OF AGE AND OLDER
(May, 1975)

	White		Black		Other*		All Persons	
	Rate per wk.	Percent	Rate per wk.	Percent	Rate per wk.	Percent	Rate per wk.	Percent
Auto (Drive and Ride)	19.24	89.2%	11.41	81.0%	4.20	75.1%	15.54	87.6%
BART	.32	1.5	.28	2.0	.29	5.2	.31	1.7
Bus and Streetcar	2.01	9.3	2.40	17.0	1.10	19.7	1.88	10.6
All Modes	21.57	100.0%	14.09	100.0%	5.60	100.0%	17.73	100.0%

*Include Spanish-heritage, Asian and other minorities.

Source: Peat, Marwick, Mitchell & Co. Travel in the BART Service Area. Document No. WP 35-5-77. September, 1977. Table 19. Based on Analysis of 1975 BART Passenger Profile Survey (BART trip) and 1975 Areawide Travel Survey (Bus and Auto trip). Differential response rate data from PPS76 used to weight responses by ethnic category.

vehicular trip-making rates for both auto and transit modes are compared among three ethnic categories —— White, Black and Other. This table indicates a lower rate of total trip-making for ethnic minority travelers, but a generally equivalent rate of BART trip-making to that of of the White population. However, compared to the transit usage patterns of Whites, it also shows that substantially higher percentages of the trips of Blacks and Others are made on the bus and streetcar systems of the area.

Station Area Analysis: BART Use Index

The TSTB Project has found that the closer people live to BART, the more likely they are to use it.* Nearly 30 percent of all weekday trips in the BART service area are made by persons who live within one mile of a BART station and approximately 13 percent by persons residing within one-half mile of a BART station. Eighteen of the thirty-four BART stations are located in areas where the total ethnic minority population exceeds 40 percent of the population within one-half mile.** This analysis is intended to address two questions: a) Do minorities who live close to BART use it less than non-minorities who live equally close? and b) Are ridership rates from minority station areas lower than in non-minority areas?

The analysis is only illustrative of relative travel patterns due to a number of limitations in the travel survey and area census data available. The important qualifications to note are:

- Population data for the area around stations are restricted to a one-half mile radius and are based on 1970 U.S. Census of Population.

- Ridership data are home-origin 1976 BART trips entering each station. Many of these originate beyond the one-half mile station area analysis area.

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* Peat, Marwick, Mitchell & Co. Travel in the BART Service Area. Document No. DOT-BIP-WP 35-3-77. Metropolitan Transportation Commission, Berkeley. September, 1977.

** McGuire, Chester. Who Are the Transportation Disadvantaged? BART Impact Program. Document No. WP 27-10-77. Prepared for the Metropolitan Transportation Commission, Berkeley, California. April, 1976.

Given these caveats, it should be clear that the ratio of BART trip origins to the population base around each station does not represent the actual rate of trip-making by residents of the station area, but rather provides an indicator of the relative rates of BART trip-making by minority and non-minority persons using the station.

The results of this analysis are shown in Table 3-7. In the fourteen non-downtown station areas with high ethnic minority concentrations (58.0% ethnic population), the average index of minority BART home-origin trips from each station compared to station area minority population is 7.3 per 100 persons; the non-minority use index in these station areas is 17.5. In contrast, the minority use index is both absolutely higher (26.4) as well as more comparable to the non-minority use index (35.5) in station areas of low minority concentrations. The table suggests that in minority areas, ethnic minority residents are less likely to use BART than non-minority residents living equally close to BART. However, in non-minority areas, principally suburban residential areas, the data presented in the table are indeterminate regarding differential rates of ridership between minority and majority residents.

Table 3-8 shows the results of comparing the number of all BART trip origins (not stratified by ethnic category) with the one-half mile station area population for non-downtown stations located in both areas of high and low minority concentration. This table indicates the BART use index computed for stations located in areas of low minority concentrations (36.1 per 100 population) is more than twice that of the use index computed for areas of high minority concentrations (13.8 per 100 population).

Attributes of BART and the Rate of Ethnic Minority Ridership

- Lower Accessibility Benefit

  In the investigation of Issue Number One and Issue Number Two, it was found that BART has provided the ethnic minority population with a generally lower gain in improved transit accessibility

Table 3-7

COMPARISON OF RATES OF BART USE (HOME ORIGINS)
ETHNIC MINORITY AND MAJORITY BART USERS
NON-DOWNTOWN STATION AREA ANALYSIS (within one-half mile)

High Ethnic Concentrations	A Total 1970 Population[a] (within one-half mile) Number	B Percent Ethnic	C Daily Home-Origin BART Trips[b] Number	D Minority Index[c]	E Non-Minority Index[d]	F Ratio (D/E)
Daly City	10,417	53.2%	4,791	30.2	63.9	.47
*Balboa Park	14,686	41.1	2,082	14.3	14.1	1.01
*Glen Park	13,851	43.5	2,749	14.6	23.9	.61
**Mission-24th	32,050	54.6	1,475	3.5	5.9	.59
**Mission-16th	31,341	59.6	1,099	2.0	5.8	.34
Corridor Sub-total	102,345	52.6%	12,196	8.2	16.0	.51
*Lake Merritt	5,158	49.1%	796	14.2	16.6	.86
*MacArthur	11,027	77.3	956	4.5	22.7	.20
Oakland West	6,295	96.0	909	5.4	229.4	.02
Corridor Sub-total	22,480	76.0%	2,661	6.3	29.5	.21
Union City	--	--	--	--	--	--
Hayward	4,565	39.2%	1,452	18.6	40.3	.46
Coliseum	6,548	95.4	866	9.9	82.5	.12
Fruitvale	6,624	62.9	1,363	10.9	37.1	.29
Corridor Sub-total[e]	17,737	68.8%	3,681	11.5	41.2	.28
*Richmond	8,914	45.9%	775	8.0	9.3	.86
*North Berkeley	11,553	48.2	966	4.8	11.7	.41
**Ashby	20,215	66.7	742	1.9	7.2	.26
Corridor Sub-total	40,682	56.9%	2,483	3.7	9.3	.40
TOTAL High Ethnic Concentration Station Areas	183,244	58.0%	21,021	7.3	17.5	.42

(Continued)

Table 3-7 (continued)

COMPARISON OF RATES OF BART USE (HOME ORIGINS)
ETHNIC MINORITY AND MAJORITY BART USERS
NON-DOWNTOWN STATION AREA ANALYSIS (within one-half mile)

Low Ethnic Concentrations	A Total 1970 Population[a] (within one-half mile) Number	B Percent Ethnic	C Daily Home-Origin BART Trips[b] Number	D Minority Index[c]	E Non-Minority Index[d]	F Ratio (D/E)
Concord	5,650	9.2	2,958	95.4	48.0	1.98
Pleasant Hill	3,166	9.8	1,820	60.6	57.1	1.07
Walnut Creek	3,600	8.5	2,043	57.8	56.7	1.02
Lafayette	--	--	--	--	--	--
Orinda	--	--	--	--	--	--
*Rockridge	9,237	23.4	1,063	6.1	13.2	.46
Corridor Sub-total[e]	16,003	20.6	7,884	30.1	54.2	.56
El Cerrito del Norte	5,585	31.6	1,438	20.3	28.3	.71
*El Cerrito Plaza	9,250	15.5	1,018	16.9	9.9	1.71
Corridor Sub-total	14,835	21.5	2,456	18.8	16.0	1.18
Fremont	2,039	17.2	2,020	117.9	95.1	1.24
South Hayward	1,519	24.6	1,067	98.2	62.5	1.57
Bay Fair	7,883	21.4	1,709	12.1	24.3	.50
San Leandro	5,976	25.5	1,050	13.9	18.8	.74
Corridor Sub-total	17,417	22.3	5,846	29.6	34.7	.85
TOTAL Low Ethnic Concentration Station Areas	48,255	21.5	16,186	26.4	35.5	.74

[a] McGuire, Chester. Who Are the Transportation Disadvantaged? BART Impact Program. Document No. WP 27-10-77. Prepared for the Metropolitan Transportation Commission, Berkeley, California. April, 1976.

[b] PPS76 Daytime (6 AM to 3PM).

[c] Ethnic Index: Total BART origins by Ethnic Minority Passengers x 100/Total Ethnic Minority Population within one-half mile of station.

[d] Other Index: Total BART origins by non-Ethnic Minority Passengers x 100/ Total non-Ethnic Minority Population within one-half mile of station.

[e] Union City, Lafayette and Orinda omitted from analysis: adequate population data unavailable.

*Stations where "other" access mode (predominantly walk trips, but including bicycle and motorcycle) exceeds 25 percent of all entering first-leg trips at stations from 6 AM to 3 PM and from 7 PM to Midnight. Peat, Marwick, Mitchell & Company. Travel in the BART Service Area. Document No. WP 35-5-77. September, 1977. Table 18.

**"Other" access mode trips exceed 50 percent.

Table 3-8

BART USE INDEX: COMPARISON OF BART TRIP ORIGINS AND POPULATION AROUND STATIONS: HIGH AND LOW ETHNIC MINORITY CONCENTRATIONS
(Non-Downtown Stations)

	High Ethnic Minority				Low Ethnic Minority			
	Number of Stations	1970 Pop. (within one-half mile)	BART Origins	Use Index	Number of Stations	1970 Pop. (within one-half mile)	BART Origins	Use Index
Daly City	5	102,345	14,102	13.8	-	--	--	--
Oakland	3	22,480	3,852	17.1	-	--	--	--
Fremont	3[a]	17,737	4,620	26.0	4	17,417	6,288	36.1
Richmond	3	40,682	2,737	6.7	2	14,835	2,664	18.0
Concord	-	--	--	--	4[b]	16,003	8,469	52.9
TOTAL SYSTEM	14	183,244	25,311	13.8	10	48,255	17,421	36.1

* Includes non-home origin trips (11,048) and home-origin trips (37,207).
[a] Union City omitted: adequate population data unavailable.
[b] Lafayette and Orinda omitted: adequate population data unavailable.

Source: Urban Dynamics Associates: 1976 Passenger Profile Survey. Daytime Period (6 AM to 3 PM).

to employment and other community opportunities in the Bay Area. This is primarily due to the fact that BART was designed principally as a regional commuter rail system to serve peak hour, long distance, work-related travel best. Since ethnic minorities tend to live in the more central areas of the region and tend to be employed to a lesser extent in the downtown areas best served, BART does not imply substantial transit travel time savings for many ethnic minority persons, particularly Spanish-heritage persons and Blacks. Also, since conventional public transit service levels are generally higher in the more dense and closer-in urban areas where ethnic minorities live in the greatest concentrations, BART competes less favorably than bus or streetcar service in the transit market. Despite overall lower accessibility gains provided by BART, the rate of minority ridership on the system reflects the size of the minority population of the Greater BART Service Area, with the important exception of the Spanish-heritage population. This is apparently due to the fact that a large portion of the ethnic minority population lives relatively close to many BART stations and is also characterized by a higher level of transit dependence than the general area population.

- BART User Costs

  There is no adequate information to establish whether BART is perceived as a more costly mode of public transportation than conventional bus or streetcar. However, there is evidence that for public transportation users travel cost is a more important factor in determining mode choice than it is for the automobile driver or passenger.* Approximately one-third of Bay Area bus and streetcar riders cite BART's cost among the primary deterrents to its use. Ethnic minority and transit dependent travelers constitute a large share of these respondents. However, without additional evidence, it cannot be concluded that

* Jefferson Associates, Inc. BART Impacts on Travel by Ethnic Minorities. BART Impact Program. Document No. DOT-BIP-TM 33-3-77. Metropolitan Transportation Commission, Berkeley. November, 1977. Table 5.

the cost of using BART is one of the most important factors explaining the rate of BART use by ethnic minority persons.

- Cultural Factors and BART's Image

  A number of culturally-related factors have been explored in the BART Impact Program which may negatively influence rate of BART's use among ethnic minorities. For the Spanish-heritage population, with the lowest rate of BART use, there is evidence that the lack of Spanish language signs and orientation information in the BART system presents a real barrier for many monolingual Spanish-heritage persons.* Case studies in the predominantly Black Richmond area and predominantly Spanish-heritage Mission District suggest that BART is often not perceived as a travel alternative for trips that it might effectively serve.** This suggests a self-perpetuating lack of community consciousness of BART, which may be related to a lower level of familiarity with BART due to less use of BART among family and friends.

  It may be true that BART's high technology orientation and "space age" design features present an image which is culturally alien and inhibiting to more members of the ethnic minority community than to the population in general. There is however, no adequate information which has been collected to support this thesis. On the other hand, the TSTB Project has found a relatively high level of fear and apprehension about the safety of the BART system among ethnic minority persons who do not use the system — anxieties which were initially shared by majority respondents prior to repeated exposure to the system.***

- Reliability

  Frequent equipment breakdowns and numerous schedule delays have caused BART to be perceived as a relatively unreliable

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* Jefferson Associates, Inc. Three Community Case Studies: Impacts of the BART System on Institutions and Lifestyles. (Working Note). August, 1977.

** Jefferson Associates, Inc. BART Impacts on Travel by Ethnic Minorities. BART Impact Program. Document No. DOT-BIP-TM 33-3-77. Metropolitan Transportation Commission, Berkeley. November, 1977. Table 5.

*** Ibid.

form of transportation. This may impact more on ethnic minority workers who hold fewer upper level and professional jobs which allow greater flexibility in work start times. Improvements in BART's schedule reliability should contribute to increased BART use among ethnic minorities for this reason.

Conclusion

The BART system provides the greatest accessibility benefits for long-distance, peak hour travel from outlying suburban areas to the downtown employment centers of the Bay Area. Because of the commuter-orientation of the system and the fact that the ethnic minorities of the Bay Area live in the greatest concentrations in the central urban areas of the region, substantial ridership by ethnic minorities may not have been expected. With respect to the Greater BART Service Area population, the rate of BART ridership is higher than the general population rate for Asians, generally equivalent for Whites and Blacks, and significantly less for Spanish-heritage. With the exception of the Spanish-heritage population, the lower average accessibility gains provided by BART have apparently been off-set by the fact that the minority population is significantly more transit dependent than the majority population of the area and that more than half the stations are located in areas of high concentrations of minorities.

The potential travel service benefit for ethnic minorities of a new rapid rail element in the total transportation system of the area has been constrained by a number of factors. The most important of these is that for shorter distance trips, BART does not compete well with the generally adequate and higher levels of conventional transit services existing in most central areas where ethnic minorities live in the greatest concentrations. Other factors, such as higher perceived user costs, lack of schedule reliability and cultural factors, including language barriers, contribute to a lesser extent in minimizing BART's potential use among these population subgroups.

ISSUE NUMBER FOUR

Has BART operation adversely affected minorities by causing reductions in AC transit and MUNI service in ethnic minority areas?

BART and Local Transit Service in Ethnic Minority Neighborhoods

In the first Implications for the Transportation Disadvantaged Project (ITD) interim report, the population characteristics of ethnic minority groups in the BART service area were examined in terms of population size, locational distribution, and degree of geographic concentration.* This analysis indicated a substantial degree of geographic concentration of the approximately 818,000 non-White population in the Greater BART Service Area.** Of the total 2,565,227 persons living in the Greater BART Service Area in 1970, 12.7 percent were Spanish-heritage, 11.8 percent were Black and 7.4 percent were other ethnic minority persons (predominantly Asian).***

Concentrations of the Spanish-heritage, Blacks and Asian populations are generally located within the central, higher density areas of the BART service area, and show a considerable degree of ethnic-specific geographic differentiation.**** These areas are generally well served by the local public transportation services operated in the Bay Area — buses, streetcars, trolleys and cable cars. Because of their more central location, ethnic minority neighborhoods typically have high densities of transit lines with frequent headways. Concentrations of each of the major ethnic minority groups in the Bay Area may be briefly summarized as follows.*****

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* Urban Dynamics Associates. Environmental Issue: BART's Implications for the Transportation Disadvantaged Project. Draft Technical Memorandum. September, 1977.

** San Francisco, Alameda, Contra Costa and northern San Mateo Counties.

*** PMM & Co. Demography of Areas Served By BART. (Working Note: Work Element IV-6). October, 1977.

**** Jefferson Associates, Inc. Minority Transportation Needs Assessment Project Maps.

***** Jefferson Associates, Inc. BART Impacts on Travel by Ethnic Minorities. BART Impact Program. Document No. DOT-BIP-TM 33-3-77. Metropolitan Transportation Commission, Berkeley. November, 1977. Table 5.

Alameda-Contra Costa Transit (AC) operates in the East Bay. Within Alameda County there are heavy concentrations of Blacks in the south and west areas of Berkeley, and in the southern areas of Union City, Hayward and Fremont. The county's Asian population resides chiefly in northwestern and western Berkeley and Oakland's Chinatown near downtown. In Contra Costa County most of the ethnic minority population resides in the Richmond area in the northern part of the county.

MUNI operates in San Francisco where Asian settlements cluster in and around the Chinatown, the North Beach district and in the outlying inner Richmond neighborhood. The Black population centers are in the Fillmore-Western Addition area east of Golden Gate Park, in the southeastern district of Hunter's Point and in the southwestern Ingleside district. The Spanish-surname and Spanish-language population is heavily concentrated in the inner and outer Mission Districts southwest of Market Street. Spanish-heritage population clusters are also located in the northern San Mateo County cities, such as Daly City and South San Francisco.

Many ethnic minority neighborhoods, especially Spanish-heritage and Black, are located in close proximity to BART lines and stations. Over fifty percent (50.7%) of the Black population in the three county area live in census tracts within one-quarter mile of BART and approximately forty percent (39.6%) of the Spanish-heritage population. These data compare with 27.2 percent of the non-Black, and non-Spanish population which live near BART in this area.* Eighteen (18) of the thirty-four (34) BART stations are located in areas where ethnic minorities live in high concentrations--greater than 40 percent of total population within one-half mile of stations.

As a result of these conditions, the introduction of BART into the Bay Area's transportation system and potential adjustments in the

*DeLeuw, Cather & Company. BART and its Environment: Descriptive Data. BART Impact Program. Document No. WN 1-4-76. March, 1976.

area's local transit system could be expected to impact ethnic minorities to a greater extent than they would the general population.

Changes in Local Transit Service

In the East Bay and West Bay, comprehensive studies were conducted to plan for the coordination of BART with local transit operations.* The objectives of these planning efforts were to provide for adequate feeder line services and to minimize duplication of service within the BART travel corridor.

West Bay

Recommendations to extend MUNI lines to serve BART stations have all been implemented. Plans to implement improved feeder bus service when BART initiated six-minute headways also have been mostly implemented. On the other hand, recommendations to downgrade bus services on routes paralleling BART lines have generally not been accomplished despite fairly substantial reductions in ridership on several lines.** In San Francisco, only one of the five recommended service reductions in the Mission Street corridor was implemented, and then only partially. In both ethnic minority and majority areas where elimination of routes or increased headways were proposed but not achieved, public and political protest can be identified as the main reason why pre-BART transit service levels were maintained.***

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* Voorhees and Associates. AC-BART Transit Coordination Project. Draft Final Report. 1974; and DeLeuw, Cather & Company. San Francisco MUNI-BART Coordination Project. Final Report. 1974.

** Peat, Marwick, Mitchell & Co. BART Impacts on Highway Traffic and Transit Ridership. BART Impact Program. Document No. TM 20-3-76. May, 1977.

*** Booz, Allen & Hamilton. The Impact of BART on Local Transit Service and Financial Policy. (Draft Working Paper). September, 1977.

East Bay

A similar pattern of local transit adjustment to BART has occurred with AC Transit operating in the East Bay. Very few significant reductions in East Bay bus service have occurred as the result of BART's operation. Only one AC Transit line has been eliminated, and significant service reductions have been implemented on four lines within the East Bay. As a result of public protest, these changes have been substantially less than the modifications and abandonments recommended for thirty of AC Transit's routes. It is estimated that BART is diverting approximately 9,700 daily trips within the East Bay which would be made on AC Transit lines if BART were not operating.* This represents approximately 6 percent of AC Transit's daily ridership. There is no evidence to suggest that reduced ridership has occurred in substantial amounts within predominantly ethnic minority neighborhoods, nor that the few actual service reductions which have occurred affect ethnic minority persons disproportionately.

Impact on Funding for Local Transit

There is a higher level of transit dependency among ethnic minority population subgroups than there is for the majority population, due to lower incomes, larger family size, and lower rates of auto ownership. It is estimated that there were approximately 33.4 million vehicle trips made weekly in the BART Service Area in May, 1975.** White residents of the area make proportionately more trips than ethnic minority residents; an estimated 85.5 percent of all vehicle travel with 68.1 percent of the area population. However, ethnic minority travelers make a substantially higher percentage of their trips on public transit than White travelers do.

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*Peat, Marwick, Mitchell & Co. BART Impacts on Highway Traffic and Transit Ridership. BART Impact Program. Document No. TM 20-3-76. May, 1977.

**Areawide Travel Survey, 1975. PMM & Co. Travel in the BART Service Area. Document No. WP-35-3-77. September, 1977. Based on analysis of May 1975 Areawide Travel Survey (for automobile and bus trips). 1975 BART Passenger Profile Survey (for BART trips).

Percentage Total Weekly Vehicle Trips*

	% BART Use	% Bus & Streetcar Use	% Total Transit Use
White	1.5	9.3	10.8
Black	2.0	17.0	19.0
Other**	5.2	19.6	24.8

These figures also indicate that for the Black population as compared to the White population, the bus and streetcar system is relied on to a considerably greater extent than BART.*** Because of the grouping of Spanish-heritage and Asian and other minorities in the "other" category used in the TSTB Project analysis, a similar conclusion regarding the relative importance of local bus service and BART service for each of these specific minority groups cannot be made. However, the share of all trips made by these "other" minorities on buses is more than twice the proportion of all trips made by Whites on conventional transit.

Given the relatively high level of transit dependency which exists for ethnic minority population subgroups, BART's impact on funding to support local transit is particularly important for ethnic minorities. Findings of the Public Policy Project indicate that:****

- despite the additional property tax burden required by BART, this has had little or no impact on the willingness of local officials to fund AC Transit or MUNI service.

- had BART not been built, local transit operators would have been eligible for additional funds beyond those now received from State and regional funding sources.

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*See Table 3-6 on Page II-30.

** Includes Spanish-heritage, Asian and other minorities.

*** These figures derived from mode-share analysis of minority travel presented in Table 2-2, on Page II-17.

**** Booz, Allen & Hamilton. The Impact of BART on Local Transit Service and Financial Policy. (Draft Working Paper). September, 1977.

BART does carry some trips that would be carried on the two bus transit systems in the area if BART were not operating. BART has also reduced operating expenditures of both AC Transit and MUNI to some extent. However, the Economics and Finance Project has estimated that the net impact of BART's operations in 1975-1976 was an additional $46.7 million in operating expenditures with only an additional $18.2 million in operating revenues for the area transit system.* This impact estimation, as shown in Table 4-1, is based on a comparison with the No-BART Alternative (NBA) which assumes a lower level of total transit service than in the 1975-1976 With-BART system.** No analysis has been conducted in the BART Impact Program to determine if a "comparable" level of transit could have been provided in the area without BART using expanded urban and suburban bus operations for less than or equal to the $28.4 million annual (1975-1976) net area transit operating deficit associated with-BART. It therefore remains a matter of judgment what might have been achieved if BART had not been built, but federal, state and local decision-makers had committed equivalent fiscal resources to the transit in the area. With this level of additional annual operating assistance, it is possible that expanded bus operations could have provided adequate service levels to outlying areas along with upgraded service in presently served minority areas where transit dependency and usage is the greatest.

Conclusion

Had recommended local transit service line adjustments been fully implemented within the BART travel corridor, ethnic minorities would have been disproportionately affected, given patterns of residential location, greater transit dependency and lower BART usage. Public protest blocked implementation of most service eliminations or reductions in AC Transit and MUNI operations.

* McDonald & Grefe, Inc. Final Report: The Economic and Financial Impacts of BART. (Working Draft). July, 1977.

** The No-BART Alternative is the transit system judged by the Metropolitan Transportation Commission most likely to have developed in 1975-1976 had the decision not been made to construct BART.

Table 4-1

BART IMPACT ON THE OPERATING COSTS
AND FINANCING OF REGIONAL TRANSIT[1]
FY 1976
(In Thousands of Current Dollars)

	AC Transit	MUNI	BART	Net Impact
Operating Expenditures	($1,451)[2]	($7,726)	$55,853	$46,676
Operating Revenues[3]				
Fares & Interest	($2,350)	($2,638)	$23,221	$18,233
Property Tax	$ 899	--	$ 5,029	$ 5,928
Sales Tax	--	--	$21,021	$21,021

[1] The BART impact on regional transit operating costs is the difference between regional transit costs with BART and without BART. This table illustrates the difference in the transit revenues and costs.

[2] Numbers in parentheses are negative numbers.

[3] Revenues do not equal expenditures because MUNI's financing has no property tax impact, nor does BART's unfunded deficit have any effect on federal or State tax rates.

Source: Metropolitan Transportation Commission. "The No-BART Alternative Financing Plan." February, 1977.

Thus, despite somewhat lower ridership on local bus and streetcar systems in the corridor as a result of BART's operations, the overall level of local transit service has not been downgraded to any appreciable extent. When compared to the designated "No-BART Alternative", the net effect of BART's introduction is shown to be an increase in total transit accessibility for ethnic minorities living in the corridor. However, there is some indication that with growing operational deficits, BART has caused a reduction in State and regional funding to local transit operators over what would probably have been available under the No-BART Alternative. Given a level of funds committed to transit services comparable to the With-BART system, the question remains whether adequate suburban commuter services, along with upgraded urban area bus services, could have been achieved had BART not been constructed.

ISSUE NUMBER FIVE

Has BART's potential benefit for the handicapped been realized with the provision of a largely barrier-free rapid rail facility?

Limitations of Evaluation

There are two general problems which impose limitations on the analysis of BART's accessibility for the handicapped and its contribution to the mobility of disabled persons in the Bay Area. These are: definition and identification of the handicapped population subgroup, and the newness and associated reliability problems of the BART system itself.

It has proven to be very difficult to estimate, with a significant degree of confidence, the size and composition of the handicapped population within the BART service area. The ITD study's concern is for the population subgroups with disabilities which restrict or preclude use of conventional private or public transportation facilities and services. There is substantial variation among handicapped individuals with respect to the type(s), degree and duration of mobility impairing disabilities. Therefore, it is almost impossible to determine the number of persons encountering any given set of problems with a specific travel mode, including BART. In general, mobility impairing disabilities may be classified into five major categories:

- Non-ambulatory disabilities,
- Semi-ambulatory disabilities,
- Functional disabilities,
- Sight, Hearing and Speech disabilities, and
- Developmental disabilities.

Population statistics from the 1970 U.S. Census of Population indicate that 6.7 percent of the national population are handicapped. *

* National Cooperative Highway Research Program Synthesis of Highway Practice: Number 39. Transportation Requirements for the Handicapped, Elderly and Economically Disadvantaged. Transportation Research Board, National Research Council. 1976.

This would suggest that in the Greater BART Service Area,* with a total 1970 population of 2,565,000, a reasonable range estimate of total handicapped persons is 150,000 to 200,000. Based on national statistics it can be estimated that over one-half (52.6%) of the handicapped population are over 65 years of age, and that over one-third (35.0%) of the elderly are handicapped.** It is estimated that only one-quarter (24.5%) of the handicapped population suffer from some form of severe disability which makes them "unable to carry on major activities", including work, school and housekeeping activities. It is clear that there is a large number of handicapped individuals whose disabilities limit rather than preclude participation in community activities. However, other than for the articulation of the need for barrier-free transportation services and total accessibility by organizations representing the interests of handicapped persons, the extent of actual and latent demand for particular accessibility features in public transportation systems remains a problematic matter for transportation planners.

The second major set of problems in the analysis of BART's impact on the mobility of handicapped persons relates to the relative newness of the BART system. BART began revenue operations in 1972 on the Richmond-Fremont line. Operations on all lines did not occur until September, 1974 with the opening of the Transbay tube. Evening service until midnight was added in November, 1974. Weekend service has been recently implemented.

The most comprehensive evaluation of BART's impact on the travel patterns and lifestyle of handicapped persons is based on studies conducted within one or two years of the beginning of service on the complete system and before planned service levels have been achieved.*** While these factors constitute a limitation for the

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*San Francisco, Alameda, Contra Costa and northern part of San Mateo County.

**National Cooperative Highway Reserach Program Synthesis of Highway Practice: Number 39. Transportation Requirements for the Handicapped, Elderly and Economically Disadvantaged. Transportation Research Board, National Research Council. 1976.

***Metropolitan Transportation Commission. The Provision and Use of the BART Facilities for Disabled Persons. BART Impact Program. Working Paper. Document No. DOT-BIP-WP 43-11-77. October, 1977.

definitive evaluation of BART's travel impact for the total population, for a number of reasons they may constitute a particular problem for evaluation of its impact on the travel of handicapped persons.

- It is likely that handicapped persons as a subgroup of the population may alter long-standing travel habits more slowly than the able-bodied population in response to the introduction of a new travel mode. Use of BART by the handicapped requires changes in habits and in the interests and activities which create demand for mobility which will require substantial time. In order to use BART effectively and without undue inconvenience or problems, the disabled person must have thorough knowledge of the characteristics of BART and its environment which he or she will encounter on a particular trip. Dissemination of information regarding a new, innovative and complex system to the handicapped population subgroup will be a lengthy process.

- Also, problems with schedule and equipment reliability impact on the disabled persons to a much greater extent than they do on the able-bodied person. In particular, problems with elevator, escalator and public address system malfunctions are more than frustrating experiences for the handicapped BART user; they pose a very real barrier to using BART without fear, personal insecurity, or undue hardship.

Due to these limitations, evaluations made in the BART Impact Program regarding mobility impacts on the handicapped population are necessarily descriptive rather than quantitative.

BART Design Objective: Total Accessibility

Historical Perspective

BART is the first public transit system in the country to be designed to provide for total accessibility by disabled persons, including those in wheelchairs. Accessibility features were planned and designed before Federal and State requirements and guidelines had been developed. To a large extent, the extensive consideration of the disabled patron in BART's design and construction is attributable to the strong and continuous efforts made by representatives of the disabled community to

persuade BART planners to incorporate accessibility features in BART.

BART's initial design had a number of features which were suitable for handicapped patrons:

- level entry to train from platform;
- escalators for vertical distances twelve feet or more;
- seats for all passengers;
- sufficient width of train doors and service gates to accommodate wheelchairs; and
- conformance to other ASA Standards (stair-widths, risers, handrails, etc.)

However, it was not until 1969 that two of the most critical, and also most expensive, features of BART's design for total accessibility became committed elements. Following state legislation and funding and extensive community pressure, the decision was made on September 11, 1969, to install elevators and accessible public restrooms in all thirty-four BART stations. By this time, the designs of many stations were complete and construction was underway in some. Poor location of elevators stands out as the principal problem resulting from failure to plan for the full range of facilities for handicap persons from the earliest stages of the design process.

Summary of Accessibility Features

The BART system incorporates a large number of design considerations which provide for barrier-free access to the system for the disabled traveler.* The most important of these are:

- All twenty-three BART parking lots have wide, reserved, preferential parking spaces for the handicapped.

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* Metropolitan Transportation Commission. The Provision and Use of the BART Facilities for Disabled Persons. BART Impact Program. Working Paper. Document No. DOT-BIP-WP 43-11-77. October, 1977.

- All station areas have curb cuts and ramps for level access.
- Elevators and escalators are provided in all stations.
- Telephones, intercom and public address systems provide for information and communication with station agents.
- A station agent is assigned to each station, who can provide assistance to the disabled person.
- Stairways, circulation corridors and doorway passages are wide and spacious.
- The train ride is relatively smooth and comfortable. Space is provided for wheelchairs in each vehicle.

Use of BART By Disabled Persons

In order to estimate the extent to which the handicapped population of the Bay Area use the BART system, a number of sources have been consulted. It is important to note in the discussion of the rate of BART's use by disabled persons that the overall rate of trip-making by disabled persons on all modes of travel is considerably lower than that of the general population. A recent survey of persons living in the East Bay indicates that disabled persons made 10.2 trips weekly; persons with severe disabilities made 6.8 per week.* This compares to an estimated average 17.7 vehicle trips made weekly in May of 1975 by the general population of the Bay Area sixteen years of age or older.**

As shown in Table 5-1, results of the on-board survey of BART users conducted in May, 1977 indicate that 1.4 percent of all BART users are using the seventy-five percent discount ticket available to certified disabled individuals. With average daily ridership of 132,000, this represents approximately 1,850 one-way trips by red discount card users. However, since as many as one-third of the elderly population are disabled, and given the fact that the elderly

* Metropolitan Transportation Commission. The Provision and Use of the BART Facilities for Disabled Persons. BART Impact Program. Working Paper. Document No. DOT-BIP-WP 43-11-77. October, 1977.

** See Table 3-6 on Page II-30.

Table 5-1

TYPE OF TICKET USED BY
BART USERS BY AGE[a]

Age	Regular (Blue)	Disabled (Red)	Elderly (Green)	SAMPLE TOTAL	
Under 18	92.8%	0.0%	7.2%	252	1.9%
18-64	98.3	1.2	0.5	12, 611	93.5
Over 64	7.6	2.3	90.1	631	4.7
SAMPLE TOTAL	12,682 (94.0%)	182 (1.4%)	630 (4.6%)	13,494 (100.0%)	100.0%

Table 5-2

PHYSICAL OR OTHER CONDITION MAKING BART
USE DIFFICULT: BART USERS BY AGE[a]

Age	No	Yes	SAMPLE TOTAL	
Under 18	96.7%	3.3%	243	1.8%
18-64	98.0	2.0	12, 600	93.6
Over 64	99.2	.8	624	4.6
SAMPLE TOTAL	13,203 (98.0%)	264 (2.0%)	13, 468 (100.0%)	100.0%

[a] Source: Passenger Profile Survey 1977. Weighted File By Station. Creation Date September 1, 1977, BART, Marketing Research Department.

ninety percent discount card (green) is more economical, there is an additional indeterminant number of elderly disabled persons using BART.

Table 5-2 also is based on data collected in the 1977 BART Passenger Profile Survey. It shows that only 2.0 percent of BART riders reported a physical or some other condition making BART difficult to use. It is important to note that this question is specific to the BART system and those indicating that BART is not difficult to use may include handicapped individuals who have overcome their disabilities in order to use BART.

A recent survey of employees who work in transportation zones which are readily accessible by BART provides an estimate of BART's use by the disabled for travel to and from work. Table 5-3 indicates that 1.8 percent of the employees sampled in the selected workplace zones reported some form of physical disability which limits or prevents using at least one of the principal modes of transportation available in the Bay Area. Of this group, 19.5 percent indicated that BART was the principal mode of travel to and from work, only slightly less than the 21.0 percent who primarily use other forms of public transportation. Nearly half (49.2%) of the disabled persons in the survey rely on the private auto for the work trip. Of all BART work trip-makers in the survey, 3.0 percent report disabilities, compared to 2.1 percent of other public transportation users, and 1.6 percent of auto drivers. The results of this survey response, suggest that there may be approximately 1,650 workers with some form of mobility impairing disabilities who use BART for their principal mode of travel to and from work in those employment centers with access to BART.

Counts made of the use of BART elevators in 1975 and 1977 provide another indication of BART's use by the handicapped. * In February, 1977, there was an average daily elevator use for the total BART system of approximately 238 trips (1.80 per 1,000 passenger trips) and 36 wheelchair user trips (.27 per 1,000 passenger trips). This

* Metropolitan Transportation Commission. The Provision and Use of the BART Facilities for Disabled Persons. BART Impact Program. Working Paper. Document No. DOT-BIP-WP 43-11-77. October, 1977.

Table 5-3

FREQUENCY OF PHYSICAL DISABILITY AMONG EMPLOYEES IN BART WORKPLACE ACCESS STUDY SUB-AREA[a]

Disability Reported[b]	Principal Mode of Travel to Work						TOTAL: Expanded Sample	
	BART	Other Public Transit	Carpool	Drive Auto Alone	Walk	Other		
Yes	19.5%	21.0%	5.4%	49.2%	4.2%	0.7%	8,425	1.8%
No	11.6%	18.1%	8.1%	54.6%	5.4%	2.1%	458,950	98.2%
TOTAL: Expanded Sample	54,991 (11.8%)	85,081 (18.2%)	37,707 (8.1%)	254,910 (54.5%)	24,910 (5.3%)	9,775 (2.1%)	467,375 (100.0%)	100.0%

[a] Source: Peat, Marwick, Mitchell & Company. Tabulations of Workplace Survey: Weighted File. Creation Date October 14, 1977.

[b] Question: "Do you have any physical disability that has lasted six months or more, which limits or prevents your getting to or using any of the transportation methods listed on the preceding pages?" (Walk, Train, Bus, Auto).

represents a 42 percent increase in elevator use over the 1975 counts; overall patronage increased by only 6 percent during this period. This suggests that utilization of BART among the disabled is increasing at substantially faster rates than for the population as a whole. However, BART use by persons in wheelchairs is still relatively low, one trip in every 3,700 BART trips. This is compared to an estimate of one person in a wheelchair for every 500 persons in the BART three county area. *

Given the small number of handicapped individuals using BART, in particular the severely handicapped, it is difficult to draw many statistically reliable inferences regarding the composition and characteristics of this group. The Transportation System and Travel Behavior Project conducted interviews with a small, and clearly not a random, sample of disabled persons drawn from the mailing list of the Center for Independent Living in Berkeley.** The results of these interviews are only suggestive and indicate the more active disabled BART user group may be substantially made up of young people (under 30 years of age), men, and individuals with access to other means of transportation which are preferred in most cases. However, this hypothesis cannot be tested due to the lack of adequate cross-sectional BART travel survey data for the disabled traveler.

These estimates of BART's use by the handicapped suggest that while BART has been designed for total accessibility, its potential to provide a major contribution to the mobility of the disabled population of the Bay Area has not been fully achieved, as of yet. Again, the problems of evaluating the impact of a new transportation facility or service for the disabled discussed previously tend to qualify this conclusion.

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* Results of survey of the National Center for Health Statistics conducted in 1969. Reported in Metropolitan Transportation Commission. BART Impact Program. DOT-BIP-WP 43-11-17. October, 1977.

** Jefferson Associates, Inc. Special Groups Mobility Analysis Meetings. Document No. WN 15-3-75. August, 1975.

Obstacles to BART Use By the Disabled

- The BART System

  The Environment Project* and the Transportation System and Travel Behavior Project** have inventoried and evaluated BART's architectural and design characteristics which create problems for the handicapped BART rider. For an extensive discussion of the problems encountered by the disabled BART user, the reader should use a report compiled by the staffs of the Metropolitan Transportation Commission and BARTD.*** The principal obstacles to effective use of BART facilities identified in this study may be summarized as follows:

  — Elevators are poorly located in many stations, difficult to identify and frequently require excessive distances to be traveled by the disabled user.

  — There is a need for greater amounts of texture changes, visual and audial orientation to guide the handicapped user through stations, particularly in the larger downtown stations.

  — Despite its highly automated technology and the expressed objective of handicapped persons for independent use of BART facilities, substantial reliance on the station agent is required for many disabled persons, particularly first-time users.

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* DeLeuw, Cather & Company. Environmental Impact of BART: The User's Experience. BART Impact Program. Draft Technical Memorandum. Curtis Associates. Community Monitoring/Phase II. BART Impact Program. Document No. WN 3-4-77. February, 1977.

** Jefferson Associates, Inc. Special Groups Mobility Analysis Meetings. Document No. WN 15-3-75. August, 1975.

*** Metropolitan Transportation Commission. The Provision and Use of the BART Facilities for Disabled Persons. BART Impact Program. Working Paper. Document No. DOT-BIP-WP-43-11-77. October, 1977.

BARTD, working with the Task Force on Handicapped Access, has initiated an ongoing program to mitigate, or correct where possible, many of these problems. However, funding is limited and many of the constraints on BART's effective utilization by the handicapped will not be overcome easily. While much can be done, particularly in the area of better information and orientation measures, a large segment will continue to confront substantial physical and psychological barriers to full use of BART facilities. Given the multiple and complex problems of the handicapped using public transportation facilities, this is not a surprising conclusion. Furthermore, it is clear that BART has provided a pioneering example of improved design and architectural environment for the disabled.

Perhaps more important than the accessibility shortcomings of BART's facilities are the problems outside BART which the disabled would-be traveler encounters.

- Local Bus Feeder Service

One of the major obstacles to BART's use by the handicapped is the lack of barrier-free public transit access to and from BART stations.* Public bus systems are not currently equipped with provisions for wheelchairs and conventional buses pose substantial problems for persons with difficulty walking, climbing steps or standing in a moving vehicle. Additionally, specialized para-transit systems have not, as yet, effectively coordinated their services with BART to any significant extent.

The bus systems operating in the BART service area now have plans for measures which should improve access to BART stations for the disabled. In October, 1977, the policy board of AC Transit adopted a resolution which establishes a total accessibility standard for all new equipment purchased by the system. All buses operated for BART's express feeder service in the East

* Metropolitan Transportation Commission. The Provision and Use of the BART Facilities for Disabled Persons. BART Impact Program. Working Paper. Document No. DOT-BIP-WP 43-11-77. October, 1977.

Bay will be equipped with wheelchair lifts within twelve months.* Test operations will begin in the near future in Concord. Additionally, AC Transit is participating in the CALTRANS research and development program intended to evaluate methods of application of total accessibility features to conventional transit equipment.

In the West Bay, the San Francisco Municipal Railway has recently undertaken an elderly and handicapped transit accessibility study.** The objective of this study is to determine the service allocation of twenty-five new buses with hydraulic lifts which are on order by MUNI. This study will consider priorities of access to activity centers, including BART stations.

In the three county BART service area, there are nearly 700 agencies which directly provide or support para-transit systems.*** These specialized transportation services for the elderly and handicapped are provided primarily by social service and non-profit agencies for specific client populations. Of the 1,196 vehicles inventoried in 1976, 49 were equipped with wheelchair lifts in the three county area. It is estimated that 40,690 one-way trips per week are provided to elderly and handicapped persons by these systems. Typically, the services offered are portal-to-portal transportation with very little interface with the BART system. A major provider of para-transit services in the East Bay, Cannon Kip, which operates 13 vehicles with lifts, reports very little demand has been evident for travel to and from BART stations.**** In addition to scheduling and transfer problems, minimal use of specialized system access to BART can be seen to be part of the larger problem of coordinating the many para-transit providers operating in the BART service area. The Metropolitan Transportation

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*Research and Planning. Alameda-Contra Costa Transit District. Interviews with Donald Larson, Manager. November 8, 1977.

**Planning Section. San Francisco Municipal Railway. Interview with Lyle Petersen, Coordinator. November 8, 1977.

***Metropolitan Transportation Commission. Regional Transit Directory. September, 1976.

****Interview with Gene Colman, Coordinator. Cannon Kip Community House. November 9, 1977.

Commission will be requiring increased coordination among these agencies and efforts to interface with and make better use of existing public transportation facilities, including BART, when suited to the travel needs of the elderly and hanicapped. *

- Physical Environment Around BART

While all stations have curb-cuts and ramps which provide for level access within the station area and parking lots, barriers within the activity centers which BART serves constitute substantial constraints on the circulation of handicapped persons beyond the immediate station area. Accessibility ramp and curb-cut construction programs have been underway for a number of years in the principal East and West Bay central areas served by BART.

The City of Berkeley has lead the way in the construction of curb-cuts and ramps to provide for level access circulation on city sidewalks. This program was begun in 1973 and should be completed this year with an average annual funding level of $30,000.

Coordinated with the Center for Independent Living, priority was given to the downtown areas, and those served by BART in particular. ** Four hundred curb-cuts and ramps have been constructed to date.

The City of San Francisco has also undertaken an extensive curb-cut construction program. *** Begun in 1973, with an average funding level of $400,000 per year, this program has completed about 2,200 of the projected 4,500 cuts and ramps to be constructed. It is estimated that approximately 40 percent of the program in the downtown area served by BART has been completed. Total accessibility within the financial district

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* Interview with Robert Levine, Programming and Implementation. Metropolitan Transportation Commission. November 9, 1977.

** Engineering Division, Department of Public Works. City of Berkeley.

*** Department of Public Works. City of San Francisco.

north of Market Street is a goal of the program to be completed by 1980.

The City of Oakland began a similar program in 1975, using Community Development (CD) Comprehensive Employment Training Act (CETA) funds. Curb-cuts and ramps have been constructed on all of Broadway Avenue adjacent to the 12th Street and 19th Street* BART stations. Fallon Street, contiguous with the Lake Merritt station and Laney College, also has been completed.

Since BART's initiation of operations, it is clear that substantial improvements have been made in the accessibility of the built-up environment served by BART. However, curb ramp construction and building accessibility programs are not complete, leaving numerous barriers and discontinuities of circulation confronting the disabled BART traveler getting to or from the station.

Conclusion

Despite the extensive provision of facilities and consideration of the handicapped in the design of BART, its full potential to substantially increase the mobility of disabled persons has not been realized. Use of BART by the disabled is relatively low; however, there is some indication that it is increasing at a rate faster than the growth of total ridership. With increased service levels, improved equipment reliability, and implementation of needed design modifications identified by BART planners, greater utilization can be expected. Also, projected accessibility improvements in local bus feeder and para-transit systems will remove existing obstacles in getting to and from BART stations. Curb cut and ramp construction programs underway in Berkeley, Oakland and San Francisco are removing many level access barriers to movement beyond station areas. With these improvements, it is clear that BART will have substantially achieved the

*Department of Public Works, City of Oakland.

goal of providing the opportunity of increased mobility for handicapped persons within the Bay Area by the elimination of barriers which previously have precluded travel for many handicapped persons. However, a continuing effort will be required to assure maximum benefit to the handicapped population who face many problems and require consideration of their total travel needs from origin to destination.

III. IMPLICATIONS

The overall purpose of the ITD Project is to identify the implications for the transportation disadvantaged of the BART system, and to draw these in such a manner as to permit their transferability to other major urban areas considering or pursuing development of rapid rail mass transportation systems such as BART. The investigation of five BART-related mobility impact issues in this report has resulted in the following initial listing of BART's travel implications for the transportation disadvantaged. A complete and finalized identification of implications will be included in the Final Report of the ITD Project. It will include not only mobility, but environmental, economic, and land use and urban development impact issues as well.

Reinforcement of Existing Travel Patterns

The overriding implication of BART's impact on the travel mobility of the various population subgroups of the Bay Area is that the introduction of this rapid rail element into the transportation system has tended to reinforce existing travel patterns rather than to reshape them. This is, of course, largely due to the fact that BART was designed to serve the existing and emerging land use development patterns of the region. As such, its principal travel service objective was to provide high speed, convenient travel to the central employment centers from the growing outlying suburban residential areas of the region. BART was designed not to counter this overall development trend, but to 1) reduce its private automobile related impacts and 2) enhance the vitality of the downtown areas by contributing to adequate access to the economic and cultural activities located within them. Given this system concept, it cannot be expected that such a regional rapid mass transit system will dramatically change existing physical, social or economic mobility patterns in the area.

To the extent that BART has had an impact on area travel, it has been largely to reinforce the comparative advantage of the middle and upper income suburban population who are economically tied to the central areas. However, BART's impacts on areawide travel have been, as of yet, relatively small — only 2.4 percent of total travel. Thus, it may be expected that BART will not dramatically accelerate or modify this overall regional land use pattern and its associated social and economic relationships or that

this may have an impact like the extensive construction of regional freeways did in the 1960's.

The transportation system in any regional urban setting is only one of many institutional parameters which support or shape the fundamental characteristics of the region's social organization and the interrelationships among its various population subgroups. The BART experience suggests that a regional rapid rail transportation system does not by itself imply better employment opportunities for the economically disadvantaged who live in the central areas where accessibility gains are the least, nor will it provide a sufficient condition for substantial outmigration or reverse commuting to the more affluent suburban areas with growing employment opportunities.

Limited Increases in Mobility for the Transportation Disadvantaged

A new rapid rail system introduced into a regional transportation system must compete with the existing extensive provisions for established modes of travel. Despite its relatively large capital investment, BART, as a 71 mile radial line-haul rail system, represents only one of many travel opportunities for the general population of the area. For the transportation disadvantaged, the BART experience to date should contribute to realistic expectations regarding the potential travel mobility impact for these special population subgroups of such an investment.

The extensive costs incurred and consideration given to improve BART's accessibility to the handicapped and the elderly, have resulted in a substantially barrier-free transportation mode. Current planning efforts in other areas for accessible transportation facilities should benefit greatly from the BART experience and perhaps more effectively overcome the types of unforeseen problems which remain for BART's use by the disabled. Such a transportation system is a necessary element of a totally accessible environment; however, full realization of its potential can occur only with the removal of the numerous physical, social and psychological obstacles which exist within the total community.

It also is apparent, that for ethnic minority population subgroups in most urban regional settings in the United States, the BART experience is relevant to the planning of rapid rail systems and their implied mobility impacts for ethnic minorities. To the

extent that income distribution, residential location, and employment patterns of the ethnic minority population of other regions are consistent with those of the Bay Area, a relatively small increase in mobility for these groups should be anticipated as part of the development of a regional, commuter-oriented heavy rail system.

Balanced Transportation System: Competing Objectives

It is clear that for public transportation decision-making, there are two implicit major objectives which, to some extent, compete with each other for the limited resources available for investment in the transportation system. The first of these is the goal of reducing the environmental impacts and congestion-related capacity constraints associated with the extensive use of the automobile, particularly during peak periods to and from work. On the other hand, the second implicit objective is to provide a high level of transportation service which meets comprehensive and varied travel needs of those dependent on public transportation. The first goal relates to the diversion from automobile to transit of those who have a mode choice, the second relates to the guaranty of a given level of mobility by public transit for those whose choices are more limited.

BART serves both these objectives to some extent; however, it is clear that it was designed to primarily serve the first. Although its impact on auto diversion has been relatively small, BART's design concept with this principal objective has not resulted in substantially enhanced mobility for the transportation disadvantaged.

The best indication of the BART Impact Program is that BART has not reduced the level of conventional transit services which could have been expected if BART had not been built ("the No-BART transit alternative"). This may or may not be the case in other regional settings where local conditions vary and the costs of financing public transportation continue to escalate as they do in the Bay Area. Where new rapid rail commuter systems are planned, commitment to continuing support of conventional transit systems, which better serve the travel needs of the transportation disadvantaged, will be an important political/policy issue, as it has been in the Bay Area.

This report has only examined the mobility and travel accessibility impacts of BART for the transportation disadvantaged of the Bay Area. Implications drawn, therefore, are necessarily incomplete. Only after integration of the analyses of all BART impacts in the ITD Final Report, will it be possible to comprehensively draw the implications of BART for these special population groups.

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